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VICTORIA.

DEPARTMENT OF MINES.

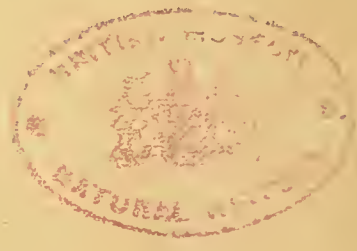
RECORDS

OF THE

GEOLOGICAL SURVEY OF VICTORIA

(E. J. DUNN, F.G.S., Director).

Vol. III., Part 1.



ISSUED BY

W. DICKSON, SECRETARY FOR MINES, UNDER THE AUTHORITY OF THE HON. PETER McBRIDE, M.P., MINISTER OF MINES.

By Authority:

J. KEMP, GOVERNMENT PRINTER, MELBOURNE.

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CAMPBELL'S REEF, MOYSTON.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The strike of Campbell's Reef is N. 20 deg. W., and its dip is nearly vertical, but slightly to the E. The country rock consists of highly altered yellow sandstone and slate, which are grey below water level. The reef ranges from 3 inches to 6 feet in thickness and the quartz is laminated. It averaged 1 ft. 6 in. thick, and the shoot of gold pitched northward.

For a length of over half-a-mile this reef was worked by means of shafts, the deepest of which is on the Kangaroo United lease and 550 feet deep.

The reef runs along the top of a ridge to the west of the township. The hill is covered by a capping of Older Pliocene conglomerate, which was auriferous, and the western slope of the hill has been extensively worked for surfacing and shallow alluvial deposits. Both the Older Pliocence conglomerate and the reef contributed towards the gold found on the slope, the former well rounded gold, the latter sharp hackly gold newly broken from its matrix. The latter gold is reported to be worth £4 2s. 6d. per oz. In the Kangaroo United mine a large felspathic dyke occurs.

About 100 feet east of Campbell's reef is a small but very rich reef, called the East Spur. It is about 1 inch thick and is traceable for some hundreds of feet in length, and has been worked down to 300 feet for part of its course. A small piece of this stone shown to me was thickly studded with gold. A party of three men is now at work on the south end of this, where they are sinking a shaft to pick up the continuation of this rich vein. With this exception nothing is being done on this line of reef.

The companies formerly working the Campbell's reef were (beginning at the north end) the North Star, the Southern Cross, the Kangaroo United, the Three Crowns, and Kennedy's.

At the south end of Campbell's reef, some work has been done on auriferous spurs, apparently with profitable results.

Half-a-mile south from the deep shaft in the Kangaroo United mine is the Sir George Bowen mine. The shaft is about 300 feet deep. Southward from this and westward from Campbell's reef the country offers inducements for the prospector.

At Moyston there is a belt of Ordovician rocks. Two miles east of Moyston is a belt of grano-diorite brecciated in appearance and similar in aspect to the grano-diorite that is favorable to the occurrence of gold, silver, copper, lead, and tin ores. At Carroll's Cutting, $4\frac{1}{2}$ miles from Ararat, the highly altered schist strikes N. 30 deg. W. and dips 72 deg. W. At Cope's Hill, $1\frac{3}{4}$ miles from Ararat on the Moyston road, the altered schist and sandstone are highly contorted and strike N. 30 deg. W. Judging from the manner in which the alluvial gullies, which head from these altered sandstones and schists, have been worked for gold, these beds should be gold-bearing, but there is little evidence of reefs having been found in them.

[Report sent in 31.7.07.]

THE STAWELL GOLD-FIELD.

By E. J. Dunn, F.G.S., Director, Geological Survey.

Stawell is 150 miles from Melbourne, on the railway line to Adelaide. The town is 759 feet above sea-level. The Black Range to the south-east of Stawell is of granite, and this rock underlies the schistose rocks in which the productive reefs occur.

On the north-east side of the town there is a low range that runs with the general strike of the schists, W. 30 deg. N. The highest portion is at the end of the principal street, and is called Big Hill. The principal mining operations have been on the town, or south-west, side of the ridge and on top of it.

Some of the salient features are the large bodies of quartz and the abundance of sulphides that occur in some of the lodes. The surface of the ground between the Sloane and Scotchman's and the Newington mines is thickly strewn with limonite that has resulted from the oxidation of iron sulphides. These large quartz lodes conform to the containing beds in dip, strike and pitch. It is also noticeable that on Big Hill there are two very large excavations from which the material has been removed in a face over large areas to a depth of as much as 50 feet, indicating that the decomposed schist with its net-work of quartz veins was profitable to treat in bulk.

The structure of this gold-field is of interest, for the top of the low range about coincides with an anticlinal axis. The arch has a wide radius and nearly corresponds with the present surface of Big Hill, where an excellent section of the saddle reef, called the Scotchman's reef, is exposed. The south-west "leg" and the saddle reef are well shewn in the open cut, but the workings do not extend far enough to shew the other leg. The north-westerly pitch of about 25 deg. is also very clearly shewn. Going south-east from Big Hill along the ridge the same leg is well exposed for some distance, and at the Hampshire reef it attains a thickness of 12 feet and upwards. Very rich quartz is said to have been obtained on the footwall of this reef which was worked for a length of 400 feet.

The workings of Stawell have been principally on three parallel legs on the south-west side of the anticlines. The abnormal strike of the anticline, W. 30 deg. N., is no doubt due to the proximity of the granite mass. The three lines worked are known as the Magdala (the lowest), Scotchman's, and the Cross reefs; they are all worked between the town and the top of Big Hill. Very extensive operations were carried on along these three lines, but the corresponding legs that should exist on the opposite side of the anticline have received very scant attention. It is stated that in a crosscut run out 1,300 feet north-easterly from the Scotchman's shaft, the other leg of the Scotchman's reef was cut. It was 31 feet thick, highly charged with sulphides and carried a little gold. This reef apparently was not further prospected.

The lowest of the three saddle reefs is the Magdala, and this was worked in the Scotchman's mine and in the Magdala cum Moonlight mine. The Scotchman's reef has been worked at the surface as at the Hampshire reef, &c., and on Big Hill, in the Sloane and Scotchman's mine, and in the Magdala mine. The Cross reef has been worked along through several mines, and is now being worked in the Three Jacks mine.

This field requires a great deal of prospecting and would probably be revived if the necessary work were carried out. The Magdala shaft is sunk to a depth of 2,409 feet, and for some years this mine held the record for the deepest shaft in the State. The Sloanes' and Scotchman's shaft is 1,030 feet deep (the Scotchman's shaft is 1,100 feet deep), and most favorably situated for prospecting purposes, and it is a great loss that the machinery was removed. From it the north-east leg of the Scotchman's reef could have been explored, and from it boring could have been done in centre country to determine what reefs occur below the Magdala reef. This field is one where boring might be tried with advantage, and until a great deal of prospecting is done it will not be possible to form an idea of its value as a mining field. One feature that would be rather unfavorable to boring is that, although the reefs worked for the most part have been with the country and along channels conforming to the bedding planes, the quartz is not continuous along the channels, and in boring these blanks might be struck. The first step needed is that a proper surface geological survey and corresponding underground surveys should be made so as to connect the several "legs" and to show their relations to one another, and also the probable positions of the north-east legs that would correspond to the south-west legs that have been so extensively worked.

Besides the regular reefs or "legs" there appear to have been irregular reefs which were worked diagonally across the regular reefs as well as spurry country which has already been referred to and which was worked on a large scale.

So far as can be judged from the work already done, and having in view the structural features of this field, it appears highly probable that well directed prospecting operations would be the means of re-establishing mining on a large scale at Stawell.

Sim's Reef.

About $2\frac{1}{2}$ miles in a N.W. direction from Stawell, Sim's party is at work on a reef that dips E. and strikes about N.W. The shaft is sunk 100 feet and a cross-cut runs out E. 25 deg. N. for 200 feet. At 163 feet from the shaft a winze is sunk 90 feet on the track of the lode. Southerly from the winze the level is extended 25 feet and northerly the level runs for 35 feet. The width of auriferous stone at the winze is about 4 feet. There are about 200 tons of ore ready to be carted away as there is no crushing plant on the ground. This ore is expected to yield 4 or 5 dwts. of gold per ton. The gold is very fine and is worth £3 17s. 6d. per oz.

A felspathic dyke resembling the dykes of Wood's Point occurs at this mine and is traceable to the Three Jacks mine, where it is many feet thick and close to the reef, and from the Three Jacks mine past the Newington mine and the Cross-reef mines and out eastward as far as the Wonga gold workings. There is no hornblende visible. Dykes of this character appear to be a feature around Stawell and their relation to the gold occurrences requires to be worked out.

The presence of alluvial gold in the gullies near Sim's reef indicates that this tract deserves to be prospected for reefs.

The Darlington Mine.

About $3\frac{1}{2}$ miles north of Stawell is the old Darlington mine which was worked till sixteen years ago. The country rock consists of highly crumpled and much altered schist. The strike of the reef is W. 30 deg. N.,

dip S.W. at 40 deg. There are two shafts; the N.W. one is 200 feet deep and the S.E. one about 307 feet. The pitch of the shoot of gold is to the S.E. At the deeper shaft the rocks near the surface are of reddish colour but those from a greater depth are greyish and much seamed with quartz veins like the Stawell country rock. The quartz mined here is said to have yielded about half an ounce of gold per ton. All plant and buildings have been removed.

The Bonny Dundee Mine.

Half-a-mile further northward from the Darlington mine is the Bonny Dundee mine. All surface plant and buildings have been removed.

The country rock is much the same as at Stawell and at the Darlington mine but not so much crumpled. The reef strikes N. 5 deg. W. and dips E. at 40 deg. Strike of country rock W. 30 deg. N., dip N.E. 85 deg. The decomposed slates and sandstones are white and grey at the outcrop. The shoot of auriferous quartz pitched southward. There is a shaft 200 feet deep and a wire fence cuts right through the shaft.

North-eastward, about half-a-mile from the Bonny Dundee shaft, and in the middle of a paddock, is a shaft over 100 feet deep in normal country rock apparently unaltered by proximity to a granite mass. The rocks are grey and yellow sandstone and slate. A reef was worked here that is reported to have yielded 4 dwts. of gold per ton of quartz.

The Germania Reefs.

The Germania reef is situate about 6 miles N.N.W. of Stawell at the end of the Iron Bark Ranges. It was discovered in 1869. There is a shaft 200 feet deep on the W. Germania reef and many shallower shafts. The country rock consists of black and dark-grey sandstones and slates, thinly laminated as a rule and contorted, but not to the same extent as the Stawell beds. The surface exposures of these rocks are yellowish and the soil is red. The quartz from the bottom of the workings is laminated. The strike of the country is N.W.; the strike of the reef is N. 20 deg. W.

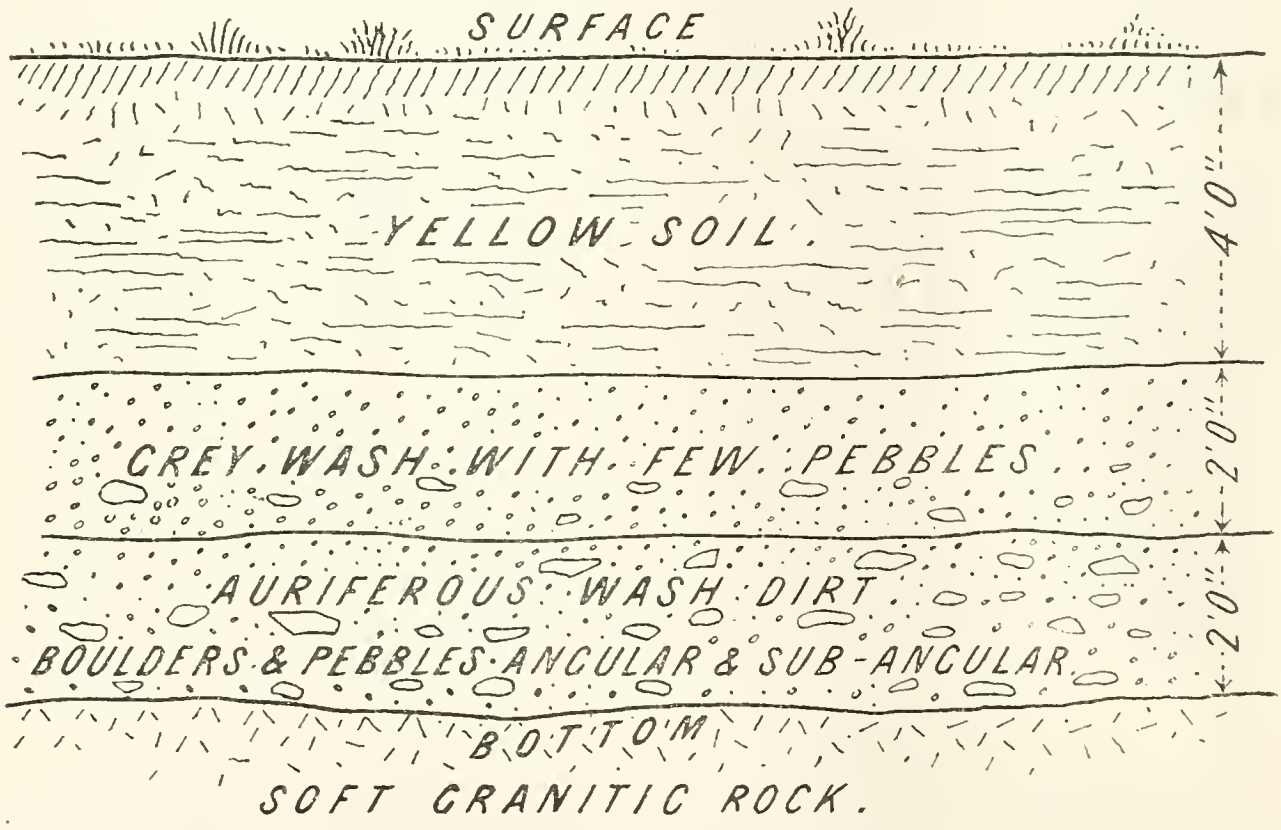

Fig. 1.

Section on East Side of Dredge Paddock, Stony Creek.

and it dips eastward at a low angle. The reef is up to 7 feet wide and 3 feet was removed for crushing. It has been faulted and thrown E. on going S. The W. Germania reef may be the faulted portion of the Germania reef. Altogether this reef has been worked at intervals for over half-a-mile. The reef worked to the S.E. from the W. Germania shaft strikes N.W. and dips N.E. at 20 deg. The strike of the country rock, which is yellowish altered slate and sandstone, is N. 20 deg. W., dip 80 deg. E.

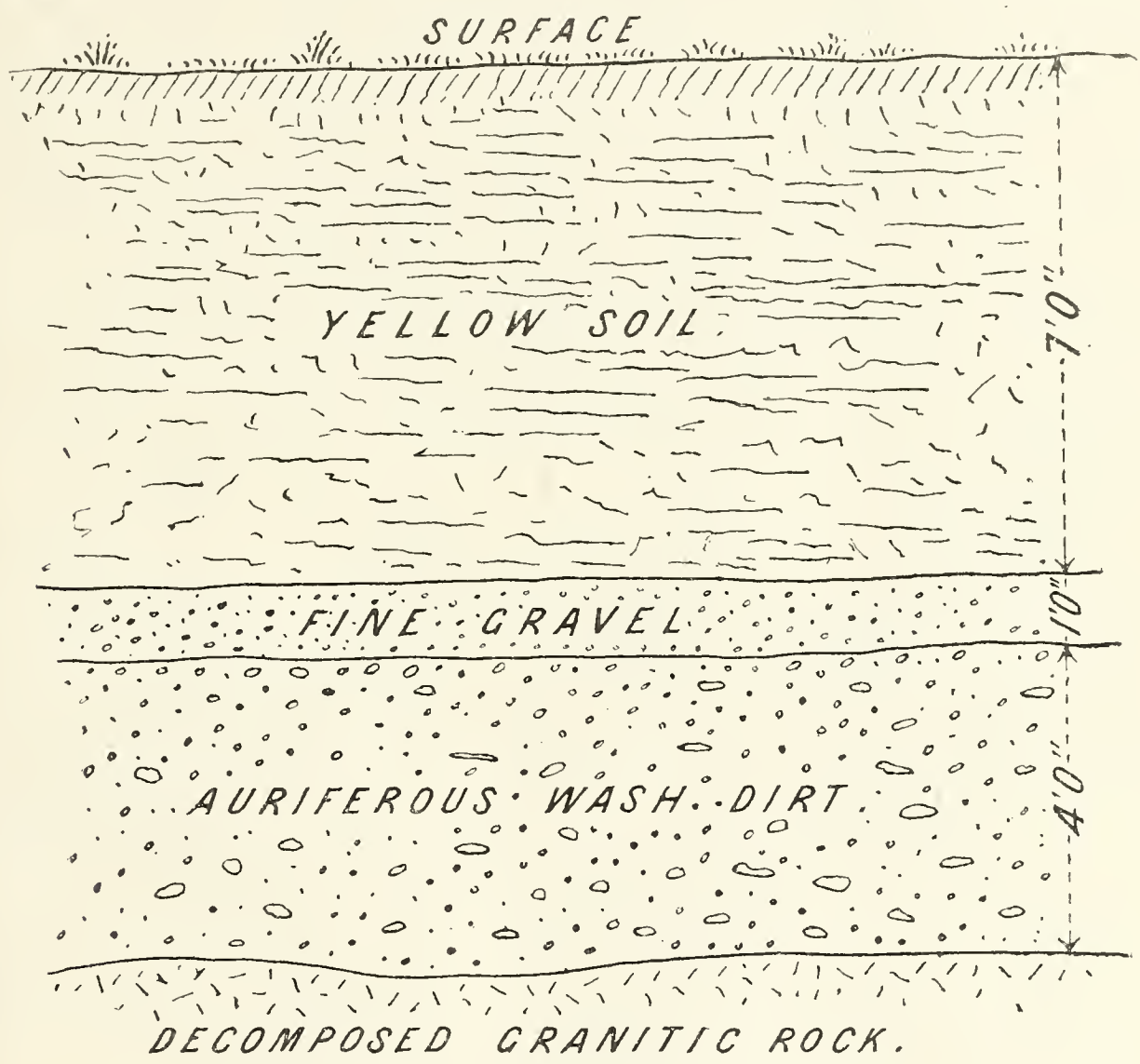

Fig. 2.

Section on West Side of Dredge Paddock, Stony Creek.

Stony Creek, Hall's Gap, Grampians.

Alluvial gold is being dredged for at this site and is considered to be derived from the grano-diorite which crops out below the Grampian sandstone. Mr. Whitehead of Stawell showed me some small pieces of gold, weighing from half a dwt. to 1 dwt. each, which were quite sharp on the angles and of local origin. Small particles of a white mineral, which proved to be calc-spar, were attached to the gold. The occurrence of gold associated with calc-spar is not usual in this State, and it would imply that a matrix of that nature has to be searched for in tracing the gold to its source in the grano-diorite.

Sloane and Scotchman's Mine.

The general strike of the Ordovician beds at Stawell on the N. side of the town where this mine is situated is about W. 30 deg. N. The great anticline would pass to the northward of the shaft, and the quartz bodies worked are portions of the S.W. leg of the Scotchman's saddle reef. The channel is continuous, but bodies of quartz are not continuous in the channel.

At the 615-ft. level a cross-cut is driven in a N.E. direction 337 feet to the foot-wall of the "leg." The lode is about 5 feet thick, of mixed quartz and country rock, but no gold. From the cross-cut the level was extended 180 feet S.E. Some quartz exists the whole length of the level, and a little gold is said to have been got near the end of the level. At the end the mixed quartz and country rock is 5 feet thick.

At the 920-ft. level the N.W. level is driven for a length of 600 feet. At 400 feet from the shaft a winze connects this level with the Magdala workings which are 400 feet below the 920-ft. level. The 920-ft. level was driven along the channel of the lode and no quartz was met with for 350 feet from the shaft. Then quartz 5 feet thick was cut. This is portion of the same leg as is found in the 615-ft. level. A stope was carried up 20 feet above the level and the quartz is 5 feet thick on top.

Down the winze connecting with the Magdala workings at 230 feet below the 920-ft. level, a level was driven N.W. for 100 feet; the quartz is reported to have been payable and 12 feet thick. Stopes were taken up to within 115 feet of the 920-ft. level and N.W. to the Magdala boundary. Above the 920-ft. level the lode is stoped up for 80 feet. This rise dips to the S.W. at 50 deg. At the top of the rise the reef has been stoped in a N.W. direction for about 150 feet. This reef would average quite 10 feet in thickness.

In this mine a great deal of work remains to be done to prospect it. The level 80 feet above the 920-ft. level should be continued N.W. along the lode channel with the object of tracing the saddle reef, and to the N.E. leg, to determine whether it is represented by a quartz lode, and if so, whether it is payable. Then work is required to prove the presence of the Magdala reef in this mine. It would be found at a higher level than in the Magdala mine, as the pitch is N.W. The breaking out and crushing of the low grade ore in sight would not help this property. What is required is sufficient capital to prospect it for the N.E. leg of the Scotchman's reef, for the Magdala reef, and for any others that may exist lower down. A proper geological survey of this and adjacent properties is much needed to render quite plain the relations of the quartz bodies to each other and the proper direction in which prospecting should be carried out. The total depth of the shaft is 1,030 feet.

The Three Jacks Mine.

The Three Jacks mine is situate about 1 mile to the N.W. of Stawell and is the most westerly of the Stawell mines. The shaft is 358 feet deep. A cross-cut is driven N.E. 128 feet to the footwall of the lode which is 9 feet wide. Along the level a drive along the lode has been extended 150 feet in a direction S. 20 deg. E. The lode dips W. 20 deg. S. at 46 deg. The lode runs with the country and is a true "leg."

At the 300-ft. level a cross-cut is driven 160 feet to the lode.

From the bottom level 470 tons of lode material yielded 147 ozs. 8 dwts. 14 grs. of gold. Concentrates gave 6 ozs. 7 dwts. of gold per ton, and the tailings yielded 3 dwts. 14 grs. per ton.

This "leg" that is being worked in the Three Jacks mine is considered to be the same that was worked in the Newington mine further eastward, and in the mines that worked the Cross reef. It is probably the Cross reef, and if so, the Scotchman's reef and the Magdala reef should be found lower down, though without a survey the depth could not be stated. Probably these reefs would be a very great depth from the surface unless they have been thrown upwards by N.W. faults as is shown to be the case along the course of the anticline easterly from Big Hill.

The Newington shaft is said to have been the first to reach 1,000 feet in depth in this State. It is about a quarter of a mile nearer the town than the Three Jacks mine shaft. The "leg" worked in the Three Jacks mine is shown on the surface within the lease.

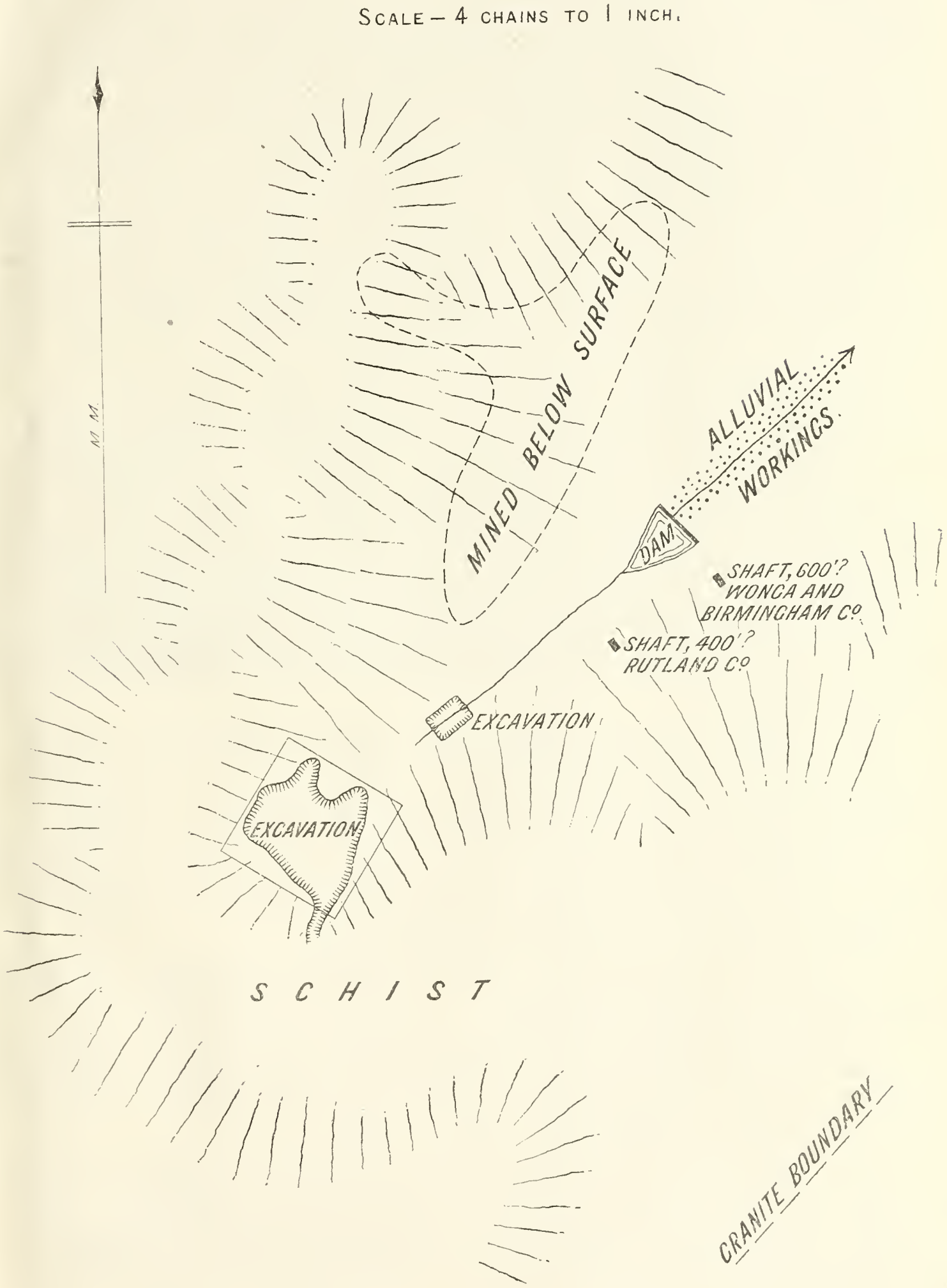

FIG 3.

Plan of the Wonga Workings, 2 miles East of Stawell.

The Grampians Sandstone.

From Stawell the Grampians appear as a grand rampart of mountains to the westward. They rise to a height of about 3,000 feet above the sea-level and consist of a succession of beds of siliceous sandstone that range from a few inches to many feet in thickness. The quarries which furnished the stone used in building Parliament House are 18 miles westerly from Stawell and connected to it by a railway; a considerable amount of work has been done but the real heartstone of these quarries is only just reached. The strike of the beds is N. 10 deg. W. and the dip is 31 deg. W. One set of joints (secondary) strikes W. 10 deg. S. and dips 85 deg. S. The master joints strike N. 20 deg. W. and dip 60 deg. E. In the quarries the stone least altered by atmospheric influences is very white and on exposure it weathers grey. There are hundreds of different beds of sandstone in these mountains and they are sure to be diverse from each other in many particulars. The minute grains of silica appear to be cemented together by white clayey material, and on exposure to the atmosphere the rain doubtless acts on the siliceous grains and dissolves a minute quantity which is again deposited on or near the surface forming in time a skin of material much harder than the interior of the stone.

At the quarry the beds range from 1 to 10 feet thick. The master joints are from 2 to 20 feet apart, and the vertical joints from 40 to 60 feet apart.

The stone opened up in these quarries is valuable for building purposes. There is practically no limit to the supply and a line of rails connects the quarries with Stawell. The cost of quarrying, now that the quarries are well opened up, should not be great, as the master joints are of the utmost assistance in getting out the stone. In this connexion it may be mentioned that the beds are under such enormous pressure that when freed from the top bed, the bed underneath often arches up slightly. Besides the uses to which this stone can be put for building purposes, there should be some of the beds that might be used for grindstones, scythe-stones, and other abrasive purposes.

It is a fault of some of the beds that there are embedded in the fine-grained material small quartz pebbles—"flinties" as the masons call them—and these are troublesome to deal with in dressing the stone. When fresh from the quarry the stone is moderately soft, but it hardens on exposure.

As this range is 50 miles long and up to 3,000 feet high, and extends on the surface for miles in width, and is all composed of sandstone, some idea can be formed of the limitless supply of stone available. It should be of great service for the masonry of reservoirs, &c.

With the endless supply of valuable stone, and the facilities that exist for quarrying it and delivering it to the railway, this industry should be capable of very great expansion.

This sandstone range is a great store of water, and as the dip is to the westward, there might be some prospect of obtaining artesian water by boring into it further westward, for outcrops of these sandstones occur for 30 miles W. of the main eastern range.

No fossils have yet been discovered in these beds. On the surface of some of the beds are curious raised discs that may be the markings caused by rain drops. At Hall's Gap, on the road to the gold workings on Stony Creek, there are three sheets of an igneous rock closely resembling the Snowy River porphyry. The petrology of these sheets and their relations to the Grampian sandstones have yet to be worked out, but if the rock proves to be true Snowy River porphyry intercolated with the sandstones, then the age of the latter must be Lower Devonian. The sandstones at this point are reddish and purplish in colour.

The analysis given below is of the heartstone now being worked at the Grampian quarries opposite Stawell. Compared with an analysis made in 1901 from the same quarry it shows a very marked improvement.

The analysis of the heartstone is of a very favorable character, and it implies that the stone possesses a composition that should insure very valuable qualities for building and other purposes. The stone formerly quarried and used in the public buildings of Melbourne was obtained from the middle zone and was not deep enough from the surface. By using such stone the reputation of the Stawell stone has been damaged in a manner that was not merited. The discrepancies between the two anlayses may probably be accounted for by considering the conditions which exist at the quarry. The quarry is at the foot of the mountain and above it are slopes of 2,000 to 3,000 feet of exposed sandstone beds. The sandstone is porous, and rain has leached out iron, lime, alkali, &c., from some of the exposed beds, and these solutions have soaked into other beds lower down, in this manner increasing the percentages of iron, alumina, lime, soda, and potash in the rock so far as these solutions penetrated, but below that depth the rock is normal. It is this unaltered rock from the bottom of the quarry which has now been analyzed.

With stone having the above composition it would be desirable to have a series of tests applied so as to thoroughly establish its usefulness. The quantity available is inexhaustible and the railway is already built to connect the quarry with the main line. As Melbourne expands a very large demand for this stone may arise if its value is indisputably established. A series of tests as to its porosity, its resistance to pressure, and its behaviour in the atmosphere of the city would be of great value. There is no other similar sandstone in the State which could be made available. The cost of quarrying should be reducible now to much less than the former price, and the quarrying and transporting of this stone to Melbourne should give employment to a considerable number of men.

	A	B	C
SiO_2 ...	93.01	96.19	71.16
Al_2O_3 ...	3.61	1.90	16.19
Fe_2O_3 ...	0.88	0.37	0.36
FeO ...	—	0.06	0.68
MgO ...	trace	0.09	0.60
CaO ...	0.71	trace	1.77
Na_2O ...	0.40	0.04	4.73
K_2O ...	0.19	0.39	2.03
H_2O – (100°C) ...	0.24	0.11	2.17
H_2O + (above 100°C)	0·82	0.48	0.22
CO_2 ...	0.53	nil	present: not detd
TiO_2 ...	—	0.10	0.11
P ...	trace	nil	trace
S ...	trace	nil	trace
Cl ...	—	trace	trace
	100.39	99.73	100.02
Sp. Gr. ...	2.326	2.618	2.665

Analyses by Mr. P. G. W. Bayly, Ass. R.A.S.M.

A. Analysis of Stawell sandstone published in the Annual Report of the Mines Department for 1901.

B. Analysis of Stawell sandstone collected by the Director of the Geological Survey (1907.) A finer-grained variety than A and from a greater depth.

C. Analysis of light coloured, felspathic dyke-stone from the Crown Cross United Mine, Stawell. Contains in addition traces of MnO and Li_2O. This material was tested as a slip. It fuses at a sufficiently low temperature for this purpose, but the glaze formed is dirty in colour. If a purer variety free from iron were available it would have a commercial value.

[*Report sent in 4.6.07.*]

THE PORT ARTHUR AND OLD HALL MINES, PIGGOREET, NEAR SCARSDALE.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The Port Arthur Mine.

The Port Arthur mine is in the same valley as the Old Hall mine and a few hundred yards to the S. of it. The shaft is 210 feet deep, and there are levels at 43 feet, 100 feet, and 210 feet. The levels are extended both N. and S. of the shaft. The strike of the reef is about N. and S., dip 88 deg. W.; the strike of the country rock is N. 5 deg. E., dip 78 deg. E.; so that this reef nearly coincides in strike with the strike of the country, but dips in the opposite direction. The country consists of dark slates and sandstones that are not much disturbed and nearly free from faults.

At the time of my visit new hauling gear was being erected and the bottom level was filled with water. The 100-ft. level was inspected. Southward the level is extended 286 feet, and northward 720 feet. About 110 feet N. of the shaft a shoot of stone has been worked which is stated by the manager, Mr. Bourke, to have been 6 feet wide.

About 200 feet further N. there is a cross reef with a little gold in it. A winze 65 feet deep has been sunk here on a good reef showing payable gold to the bottom and dipping 83 deg. to the W.

About 480 feet in, the reef is 8 feet wide and said to be worth about 4½ dwts. of gold per ton. The shoot of gold here is about 140 feet long.

At 520 feet N. a winze is sunk 25 feet deep in the reef all the way. At 665 feet N. the reef has been stoped for 40 feet N. and 120 feet S. At the end of the level (720 feet) the reef is 4 ft. 6 in. thick, and is said to be worth 5 dwts. of gold per ton. The strike of the reef is N. 6 deg. E., dip 83 deg. W. The average width of the reef in the level S. of the shaft is about 20 inches.

So far as the workings examined are a guide, this mine presents very favorable appearances. The country rock is excellent and not much disturbed. The reef is a large one and appears to be of a permanent character, and it carries gold in shoots for a considerable portion of its length. The conditions are such as to warrant vigorous sinking to prove the ground at lower levels.

The South Port Arthur mine is a short distance away from the above mine, and the North Port Arthur mine in N. of Piggoreet township, and sinking on what is considered to be the northward extension of the Port Arthur line of reef. Still further N. is the Port Arthur Consols mine.

Great caution should be observed in these mines in approaching the old alluvial workings as the levels are extended for very great bodies of water have accumulated in the old ground.

The work now being done on this field may open up a new quartz mining area, although this is not the first attempt to develop it, as some work was done in this direction over 30 years ago.

The Old Hall Mine.

The Old Hall mine is situated in a narrow valley, the lower portion of which is cut out of Ordovician rocks. The upper part is in a capping of basalt. It is close to and on the east side of the township.

The shaft is sunk to a depth of 130 feet to the main level, and it is still about 15 feet above the creek level. At 116 feet northward from the shaft is a short crosscut. The beds consist of grey and black ribbony schists with a dip of 85 deg. W. Small quartz spurs occur. A band of material with much iron pyrites through it and carrying gold was worked here. At the end of the crosscut, harder sandstone is present.

At about 127 feet north of the shaft is a rise of 23 feet, and over this rise about three feet of auriferous material—a mixture of graphite, quartz, and iron pyrites—was worked. (This is the country rock much contorted and crushed and cut through by quartz veins). Stoping has been carried on for 40 feet south of the rise, and north of the rise the stopes extend for 20 feet to a fault wall showing graphite which cuts through the reef without displacing it. At this point the auriferous lode material was 8 feet wide.

About 150 feet in, a crosscut has been put through the reef which strikes about north and south and dips 84 deg. W. At 270 feet, a crosscut is driven 25 feet to the east. This shews the reef to have been faulted and thrown 7 feet to the east looking north. The strike of this fault is north-east. The reef is 2 feet thick, but from this point northward the channel has been followed without any valuable quartz development. At 488 feet is the end of the level. The west wall is well marked and dips 84 deg. to the west. In the channel, there is about 20 inches of crushed country, with thin quartz veins.

At the surface a strong outcrop of the reef shews about 2 chains south of the shaft. Its strike is about north and south, and it dips 84 deg. W., and the quartz ranges in thickness from 1 ft. 6 in. to 3 feet. To properly test the value of this reef it would be necessary to deepen the shaft and to drive levels along the lode. The country rocks here are alternating black and grey slaty beds very much crushed and distorted near the walls of the lode. Until some fossils are obtained there will be difficulty in determining their proper horizon. The line of reef worked appears to be to the east of that worked in the Port Arthur group of mines. Mr. Ponsonby and his manager supplied much of the data.

[*Report sent in 16.5.07.*]

THE DUNOLLY GOLDFIELD AND THE NEW BIRTHDAY MINE, GOLDSBOROUGH.

By E. J. Dunn, F.G.S., Director, Geological Survey.

One of the broad features of the Dunolly gold-field is that there is a considerable extent of alluvial ground that has proved extremely rich

in gold and that has produced many large nuggets, while the bed-rock on which this rich alluvial gold reposed has not yielded at all commensurately from the quartz reefs. At first sight this appears anomalous, but the discovery by Mr. Ferguson, who is preparing a plan of this district, of graptolites that have been determined by Dr. T. S. Hall to belong to the Lancefield or basal zone of the Ordovician series gives a clue.

There are three distinct classes of auriferous alluvial deposits near Dunolly. The earliest represented consists of the Hard Hills and Gooseberry Hill remnants, of what has been classed as Older Pliocene drift. At one time these were all connected, and from Goldsborough and probably for miles northward, right down to Gooseberry Hill, there was a continuous belt of well-rounded quartz boulders and pebbles cemented into a conglomerate in many places, and very ferruginous in others. Only about four outliers remain between Goldsborough and Gooseberry Hill now. Each of these remnants, which occur on the hill tops, has evidently been richly auriferous, for every scrap of the ground has been worked over. This riband of gravel that was once continuous represents an old river course, and, judging from the size of the boulders of quartz showing in one place, the stream must have been strong and large. It was the main drain along this tract of country, and therefore the strip of gravel marked the lowest line of country. Rising on either bank from this stream were hills, and these may have attained to hundreds of feet above the level of the stream. It is certain that the pebbles and boulders in the stream were subjected to much wear and tear before they were finally deposited where they now rest. The quartz of which these pebbles were formed may have seamed these ancient hills, and the gold in the bed of the stream was derived from the breaking down of the quartz veins.

The outliers left of the Older Pliocene repose on Ordovician rocks of the Lancefield zone, but the rocks which supplied the quartz and the gold belonged to the higher Bendigo zone, which is more productive in gold. This has been worn down and carried away, and the resulting gold and pebbles of quartz rest on a much poorer bedrock.

After the Older Pliocene times the hills were denuded still more, and even the Older Pliocene well-rounded gravel of the old river bed was worn away in places, until what was once the lowest part of the country now forms the hill tops, and the gold and pebbles were co-mingled with more angular and but partly-rounded quartz pebbles and with much ferruginous material, and these were again deposited at a lower level as Newer Pliocene, which is present and has been worked on the large flat west of Dunolly, on Gooseberry Hill, &c. Still later denuding influences cut more deeply into the Older and Newer Pliocene deposits, leaving only fragments of the former and cutting gaps cut out of the latter. The mixed but loose material resulting from this forms the recent gravels that are as much as 70 ft. deep north of Gooseberry Hill.

And so it has happened that on a zone of rocks poor in gold the gold derived from a higher and more productive zone has been deposited, and this is why at Dunolly, although such great quantities of alluvial gold and many large nuggets were found, there has been disappointment in the reefs that occur in the bed rocks on which the alluvial gold rested, and the outlook for gold in the quartz reefs, at any rate in the immediate vicinity of Dunolly, is not very favorable.

Further north the country appears to be more promising, and in this tract which lies south of Moliagul, indicators have apparently had much to do with the occurrence of gold which was generally coarse and nuggety.

New Birthday Gold Mine, Goldsborough.

The workings are inaccessible at present, but the manager, Mr. Nicholson, shewed me the plans and explained the facts.

This mine occurs on a line of reef that has been worked at intervals in a northerly direction as far as Moliagul and for a mile in a southerly direction. There are three shafts. The south shaft is 838 feet deep, and 11 ft. 6 in. x 3 ft. 6 in., divided into three compartments, and, although not in good repair, it could be put right at a moderate outlay. The last work was done in a southerly direction from this shaft, and Mr. Nicholson considers the quartz obtained in that direction deserves further prospecting. Samples of the quartz shown me are thickly studded with arsenical and iron pyrites, and a little gold is also present. A cross-cut costing about £300 would suffice to reach this body of quartz at a lower level and prove whether it is payable or not.

The Queen's Birthday main shaft is the middle shaft, and this is 11 ft. 6 in. x 4 ft., in three compartments, with pumps. The shaft is in good order.

The north shaft known as the Goldsborough shaft is 750 feet deep, but it is in such bad condition that it could not be used.

The Queen's Birthday reef strikes about N. 15 deg. W., and is about vertical. It follows along the course of the east wall and cuts through the beds. The Western reef dips west at about 70 deg. also cutting across the beds. The two reefs at their junction form a thick mass of quartz that was richly auriferous and from which the bulk of the gold was obtained. As the west reef descended it dipped away to the west at 70 deg. Both east and west reefs were auriferous in places below where they junctioned.

At a depth of about 450 feet from the surface a fault dipping west at a low angle cut off the auriferous quartz, and below that nothing has been found of value. Besides this fault another set of transverse vertical faults cut up and displaced the quartz reefs to the extent of several feet, in some cases transversely. Vertically the displacement is not known.

A feature that is favorable is that the line of reef of which this mine has worked a short length with most profitable results extends for several miles in length with reef workings at intervals. Alluvial gold also has been worked up to this line at a great many places.

What is still in doubt is whether the country below the 450-ft. level is productive. The Queen's Birthday reef is in Ordovician country consisting of brownish quartzite and sandstone and slate of grey colour. Some of the sandstones are thickly sprinkled with brown spots showing where carbonate of iron occurs. East of the central shaft, black shales thickly studded with large and small cubes of iron pyrites were obtained. It appears probable that these beds are either high up in the Lancefield zone or at the bottom of the Bendigo zone, and as the Lancefield zone is not very productive in gold it is quite possible that sinking might mean entering a poor or barren zone. The central shaft is the most favorably situated for further prospecting the ground, but the further sinking of it is not likely to cut the continuation of the shoot of gold worked above the 450-ft. level, and any work done will be purely prospecting in unknown country. In this case it is fairly certain that the country rock below present workings is beneath the richer zones.

[Report sent in 8.10.06.]

REPORT ON A NEW RUSH ABOUT TWO MILES SOUTH OF DUNOLLY.

By W. H. Ferguson.

The site of the new rush is the north-east corner of allotment No. 21 (J. Peter McBride), about 2 miles somewhat to the west of south from Dunoily. Gold was first found by Messrs. Watts and party, who hold the prospecting claim. Mr. Hunter's geological sketch plan of Dunolly shows in the next allotment to the south a lead called the Red Streak. It was worked many years ago into the south side of allotment 21. The present rush is probably on a continuation of it. The lead is of post-Tertiary age, and is of considerable local altitude, and crosses the ridge southwards towards the Windmill reef. There is a considerable area of post-Tertiary formation in the vicinity, and the prospectors were of the opinion that the lead would continue through allotment 21, towards Fighting Flat. They recently sank some shafts in the north-east corner of the allotment, and have proved a lead at a depth of 47 to 55 feet.

The party washed eleven loads* for a return of 26 dwts.; since then about the same quantity was washed and only yielded a little over 5 dwts., which is not payable. Two other claims have bottomed and proved gold. The washdirt is about 1 foot thick and the lead is dry. The sinking is through yellow, brown, and white clays, with sub-angular and water-worn gravel, and boulders of ironstone and quartz. The gold is worth up to £4 3s. an oz. The ground along the supposed trend of the lead has been taken up in claims. The owner allowed the prospectors in free, and charges £2 each for other claims.

The position of the new rush is of great interest as it is on the strike of the Inkerman nugget belt. The reefs at Inkerman are associated with a soft dark-blue slate, which is studded with cubes of iron pyrites. Such slates in this district appear to be "Indicator" bands. The Windmill reef is located about half-a-mile south of the new rush, and at this reef, from which some rich crushings were obtained, a slate identical in appearance occurs. From the Windmill reef the distance northwards to the Inkerman field is about 7 miles, and between them a narrow nugget belt appears to extend.

Along it there have been found, at Inkerman, nuggets of 120 ozs. and others; at Turkey Flat, a nugget of 95 ozs. and others; at Hard Hills, nuggets of 50 ozs., 70 ozs., and 18 lbs.; at Clay Gully, a nugget of 25 ozs. and others; at White Lead, near "Hog Bay," a nugget of 30 ozs.; at White's paddock, nuggets of 250, 40, 30 ozs; and in the Red Streak Lead, south of the new rush, nuggets of 30 ozs., 25 ozs., and others. The belt probably continues towards Maryborough, and may be defined when the country intervening has been surveyed in detail.

It is probable that the post-Tertiary accumulations around the new rush may carry nuggets. During the survey work here, I have noted wide areas of Terrace and post-Tertiary accumulations, which have not been prospected. For instance, on the east side of the Moliagul-road, from opposite the Goldsborough Railway Station to near Dunolly, there is a strip of post-Tertiary to Recent formation, which skirts the hills. In places the bottom is known to be deep, but it has not been prospected and may cover auriferous leads.

[*Report sent in 15.7.07.*]

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* A load is roughly one ton.

NUGGETS AT THE POSEIDON RUSH AND AT IRONBARK GULLY, NEAR TARNAGULLA.

By A. M. Howitt.

The Poseidon Rush.

The Poseidon rush was opened by J. Porter, who had been prospecting for several years in the Tarnagulla district and for some time around the Woolshed Reef Hill, about 5 miles from Tarnagulla.

With a small hand bore he traced the dip of the surface of the bedrock, and on finding indications of a gutter to the south-west of the Woolshed Hill, he put down a shaft on Cup Day, the 6th November, 1906, on Crown lands, but close to Weymes' allotment 14A, parish of Tarnagulla.

From the bottom of this shaft (19 feet deep), he obtained 7 ozs. of gold, and immediately registered his prospecting claim as "The Poseidon," after the Cup winner, thus giving the field its name. Then followed the discovery of some of the large nuggets of gold, and with these discoveries, people of all classes and from all localities flocked to the rush, and the canvas town of Poseidon soon appeared, and a busy line of claims marked the trend of the lead, east in the Crown lands and to the west through Weyme's allotment 14A.

At the head of the lead the shallow sinking is in dark-brown surface soil and clay, and it was in this ground that the largest nuggets were found.

"The Poseidon," weighing in the gross, 953 ozs., discovered by Woodall and party on 12th December, 1906, was perched 2 inches above a conical bump of the bedrock, and within 10 inches of the surface.

The 'Xmas Box, 373 ozs., the Hazel, 502 ozs., the Georgenia, 86½ ozs., the Leila, 675 ozs., the Federal, 387 ozs., and a smaller specimen of 21 ozs., were all discovered in this surface clay, and all a few inches off the bottom (see list p. 16).

The gross weight of these few nuggets, together with the little gold obtained in addition, would total just over 3,000 ozs. All this gold was taken from a strip of ground 84 feet in length—the distance between the two extreme nuggets.

Of these nuggets, Messrs. Smith, Stephenson, and Rogers obtained 1,672 ozs., which yielded 1,382 ozs. on smelting. This claim has yielded £1,900 per man, and has been so far the richest claim on the rush.

The next rich claim is that of Jackson and Hughes and the first shafts are seen here. The ground is 8 feet to 10 feet deep, and is composed of red sand, clay, and gravel, occurring in a gutter with a somewhat bumpy bottom. This claim has yielded several large nuggets, amongst them being the "Little Jack," 252 ozs. gross weight, and the "Little Ben," 152 ozs. gross weight. The larger nuggets were all above the bedrock. (See list, pp. 17-18. Nos. 6, 8, 15, 17, 19, 26, 33, 37, 38, 57.)

Wragge Bros.' is the next claim of importance. Here the sinking is red sand and rubble of slate and sandstone, then about a foot of white and red stiff clay ("pug") seams, then a foot of sand and clay, with floating pieces of slate and sandstone, and on the bottom white pug and angular quartz. They are taking the whole claim, 60 feet, but the gutter, containing the best gold, is only about 15 feet wide and shows more quartz.

Amongst the large nuggets from this claim may be mentioned "The Fort Arthur," 206¼ ozs. gross weight. Nearly all the nuggets in this claim were on the bedrock. (See list, Nos. 7, 11, 22, 23, 24, 40, 55).

Cox and Newit's claim has given consistent yields, and the sinking is similar to that in Wragge Bros. claim. The largest nugget so far found in this claim is "The Shellback," 127½ ozs. gross weight, and containing much quartz. (See list Nos. 9, 16, 29, 41, 44, 48, 56, 59, 60).

At Mackenzie and Younghusband's claim the sinking is unchanged and 13 feet deep. "The New Year's Gift," 104¼ ozs. gross weight is the largest nugget from the claim. (See list, Nos. 10, 34, 49, 53, 61).

J. Porter's claim is situated partly in the Crown lands and partly in Weymes' allotment 14A, and has not been worked as continuously as the others. Some of the yields are—7 ozs. off the bottom of the prospecting shaft; eight loads washed for 7 ozs., besides small nuggets of 14 ozs., 2 ozs., and 1½ ozs. Since my return a 26 oz. nugget has been found.

The lead now leaves the Crown lands and trends through Weymes' allotment 14A, in a westerly direction, for about 12 chains and then turns sharply to the north.

Before reaching the turn it passes through the claims from Cummins and party to Armstrong and party, increasing gradually in depth from 25 feet to 46 feet. Up to this it was practically dry, but as it turns north water is met, and after the junction with another lead coming in from the west the water gradually increases to 50 gallons an hour where the lead crosses the road before entering allotment 9.

In the deeper ground after the bend to the north, some of the claims are being worked with whips, and the sinking has been through red sands, clays, gravels, iron cement, and sub-angular quartz and gravel wash, with a little pug.

The wash has been taken in varying thickness, from 1ft. 6in. to 3 feet and 4 feet in some claims.

The yields reported, of which some are given in the following list, have been from 1½ dwts. up to 1 oz. to the load:—

Claim.	Depth.	Yield per Load.
	feet.	
Radnell and party	52	1½ dwt. to 4 dwt. per load
Patterson and party	53	2 dwt. per load
Wheeler and party	53	2¼ dwt. per load
Baker and party	55	5 dwt. (and a 9½-dwt. slug)
Baker and party (reported since my return)	55	18 loads for 12½ ozs. (including 5-oz. slug)
Paul and party	56	3½ dwt. (also 20 loads for 4 ozs., including 2-oz. slug)
Rivett and West (Whip Claim)..	58	1 oz. per load
Glover and Tyres (reported since my return)	60	Specimens of 5 ozs., 1½ ozs., 2 ozs. 11 dwt.
Bayly and party (on road) ..	64	Reported payable

On the whole the gutter is narrow, but very rich in the shallower claims. It has a bumpy bottom of Ordovician slate and sandstone, and many small turns along its course.

The nuggets have been generally found above the slate and mostly on the north side of the gutter.

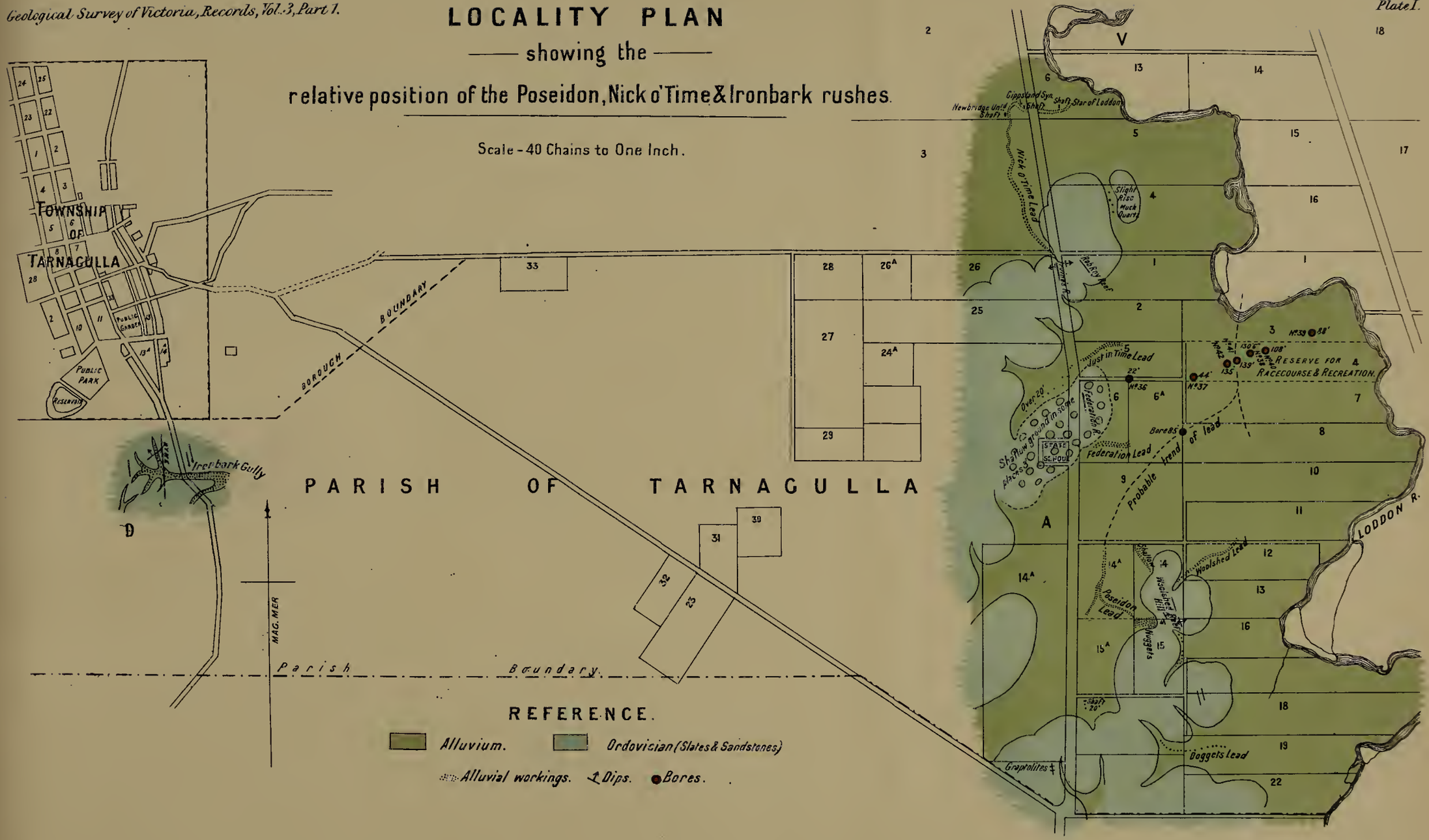
In the shallow ground to the south of the main gutter several nuggets have been found in the dark-brown surface clay above the bottom. These outside nuggets are scattered here and there, and so far do not show any trace of arrangement relatively to one another, such as there would be if they occurred in another gutter. Of the outside nuggets, Bravo and Leighton have found the largest, "The Groper" and another, 146 ozs. and 148½ ozs. The various outside nuggets are referred to in the nugget list. (See Nos. 13, 27, 30A, 31, 59, 65, 66, 67).

LOCALITY PLAN

— showing the —

relative position of the Poseidon, Nick o'Time & Ironbark rushes.

Scale - 40 Chains to One Inch.



BRITISH
NATURAL HISTORY

The following list of nuggets is made to the 6th February, 1907. Recent yields reported from the field are given in another list :—

No.	Name of Nugget.	Finder.	Date Found.	Depth.	Weight. Gross.	Weight. Net.	Remarks.
				ft. in.	oz. dt.	ozs.	
1	The Poseidon ..	Woodall and party	18.12.06	0 10	953 0	703	2 inches of clay between this nugget and the bedrock. This nugget showed much quartz. Model obtained
2	The Leila ..	Smith, Stephenson, and Rogers	3.1.07	1 3	675 0	..	This nugget was about 6 inches above the bedrock. Model obtained
3	The Hazel ..	Smith, Stephenson, and Rogers	5.1.07	1 3	502 0	..	This was a few inches above the bedrock
4	The Federal ..	Smith, Stephenson, and Rogers	12.12.06	1 3	387 0	322½	2 inches above bedrock. Model obtained
5	The Christmas Box	Williamson and Stephenson	18.12.06	1 3	373 0	306	In surface soil, and 9 inches off the bedrock
6	The Little Jack	Jackson and Hughes	4.2.07	6 0	252 0	200	On the north side of gutter, and containing much quartz. Model obtained
7	The Port Arthur	Wragge Bros. ..	1.2.07	11 0	206 5	About half	Right on the bottom, and with much quartz. Model obtained
8	The Little Ben	Jackson and Hughes	14.12.06	4 0	152 0	120	Fairly clean, and 1 foot above bedrock
9	The Shellback	Cox and Newit ..	24.1.07	13 0	127 10	..	Showing much quartz. Model obtained
10	The New Year's Gift	Mackenzie and Younghusband	8.1.07	13 0	104 10	75	Shows much quartz Nearly on bedrock
11	The Gem ..	Wragge Bros. ..	29.11.06	9 0	88 0	80	On bottom. Model obtained
12	The Georgina..	Smith, Stephenson, and Rogers	4.1.07	1 3	86 10	..	A few inches off bedrock. Model obtained
13	The Outsider ..	Hannan and Gascoyne	2.2.07	3 0	87 0	..	About 1 ft. 3 in. from bedrock. Model obtained
14	.. ..	Michael and party	18.12.06	23 0	50 0 reported	23¾	On bedrock
15	.. ..	Jackson and party	..	10 0	40 0	..	4 inches above bedrock
16	.. ..	Cox and Newit ..	..	13 0	33 0	..	
17	.. ..	Jackson and party	..	10 0	32 0	..	4 inches above bedrock
18	.. ..	Bravo and party ..	29.11.06	25 0	40 0	32	First large nugget in Weymes' allotment 14A. Right on bedrock
19	The Lancaster	Jackson and party	1.2.07	9 0	29 0	..	On bedrock. Model obtained
20	.. ..	O'Brien and party	—.12.06	27 0	27 10	..	On bedrock
21	.. ..	Cummins and party	—.12.06	25 0	26 0	..	On bedrock
22	The Twins	Wragge Bros. ..	1.1.07	11 0	24 0	..	On bedrock. Model obtained
23	The Twins	Wragge Bros. ..	1.1.07	11 0	23 15	..	On bedrock. Model obtained
24	Little Nell ..	Wragge Bros. ..	4.2.07	11 0	22 6	..	10 inches above bedrock. Model obtained
25	.. ..	Smith, Stephenson, and Rogers	..	1 3	21 0	..	A few inches off bedrock
26	.. ..	Jackson and party	..	9 0	20 0	..	On bedrock
27	.. ..	Johnson and party	26.11.06	shallow	19 0	..	Outside main run
28	.. ..	Nicholls and party	..	27 0	18 0	..	1 foot above bedrock
29	.. ..	Cox and Newit ..	26.11.06	13 0	18 0	..	
30	.. ..	Michael Bros. ..	10.12.06	23 0	18 0		
30A	.. ..	Williamson and Son	—.2.07	shallow	16 0	..	40 feet south of "Christmas Box"
31	.. ..	.. .. ..	..	shallow	15 16	..	Outside main run. South of Jackson's
32	.. ..	Tuomey and party	4.2.07	38 0	15 15	..	On bedrock
33	.. ..	Jackson and Hughes	..	9 0	14 0	..	On bedrock
34	.. ..	Mackenzie and party	1.2.07	14 0	14 0	..	On bedrock

NOTE.—The nuggets are marked on the plan by red crosses and numbers corresponding to those in the list.

List of Nuggets—*continued.*

No.	Name of Nugget.	Finder.	Date Found.	Depth.	Weight. Gross.	Weight. Net.	Remarks.
				ft. in.	oz. dt.		
35	.. ..	.. .. ..	..	shallow	14 0	..	10 feet south of Mackenzie's
36	.. ..	Bravo and party ..	..	25 0	12 10	..	On bedrock
37	.. ..	Jackson and party	..	4 0	12 10	..	Near the bedrock, on the north side of gutter
38	.. ..	Jackson and party	..	9 0	12 0	..	On bedrock
39	.. ..	Armstrong and party	..	46 0	12 0	..	On bedrock
40	.. ..	Wragge Bros. ..	10.12.06	9 0	12 0	..	On bedrock
41	.. ..	Cox and Newit ..	..	13 0	11 0	..	On bedrock
42	.. ..	J. Porter (prospector)	29.11.06	16 0	11 0	..	On bedrock
43	.. ..	O'Brien and party	29.11.06	27 0	10 10	..	1 foot above bedrock
44	.. ..	Cox and Newit ..	1.2.07	13 0	10 0	..	
45	.. ..	Taylor and party ..	..	39 0	9 10	..	On bedrock
46	.. ..	Dorey and party ..	29.11.06	4(?)0	9 0	..	On bedrock
47	.. ..	Cummins and party	..	25 0	9 0	..	On bedrock
48	.. ..	Cox and Newit ..	..	13 0	6 0	..	
49	.. ..	Mackenzie and party	..	14 0	6 0	..	On bedrock
50	.. ..	Phillips and party	..	39 0	6 0	..	On bedrock
51	.. ..	Phillips and party..	..	39 0	5 0	..	On bedrock
52	.. ..	Michael and party	..	36 0	5 0	..	2 inches above bedrock
53	.. ..	Mackenzie and party	29.11.06	14 0	4 0	..	On bedrock
54	.. ..	Taylor and party ..	..	39 0	4 0	..	2 ft. 6 in. off bedrock
55	.. ..	Wragge Bros. ..	10.12.06	9 0	4 0	..	On bedrock
56	.. ..	Cox and Newit ..	..	13 0	3 0	..	
57	.. ..	Jackson and party	..	9 0	3 0	..	On bedrock
58	.. ..	Taylor and party ..	..	39 0	2 15	..	On bedrock
59	.. ..	.. .. ..	..	shallow	2 0	..	40 feet outside main run. South of Wragge's
60	.. ..	Cox and Newit ..	..	13 0	2 0	..	
61	.. ..	Mackenzie and party	..	14 0	2 0	..	On bedrock
62	.. ..	Watts and party ..	..	42 0	2 0	..	On bedrock
63	.. ..	.. .. ..	..	shallow	1 16	..	Notable as being above the "Christmas Box"
64	.. ..	Woodall and party	..	1 0	0 13	..	Notable as being only other slug in Woodall's claim which yielded the "Poseidon"

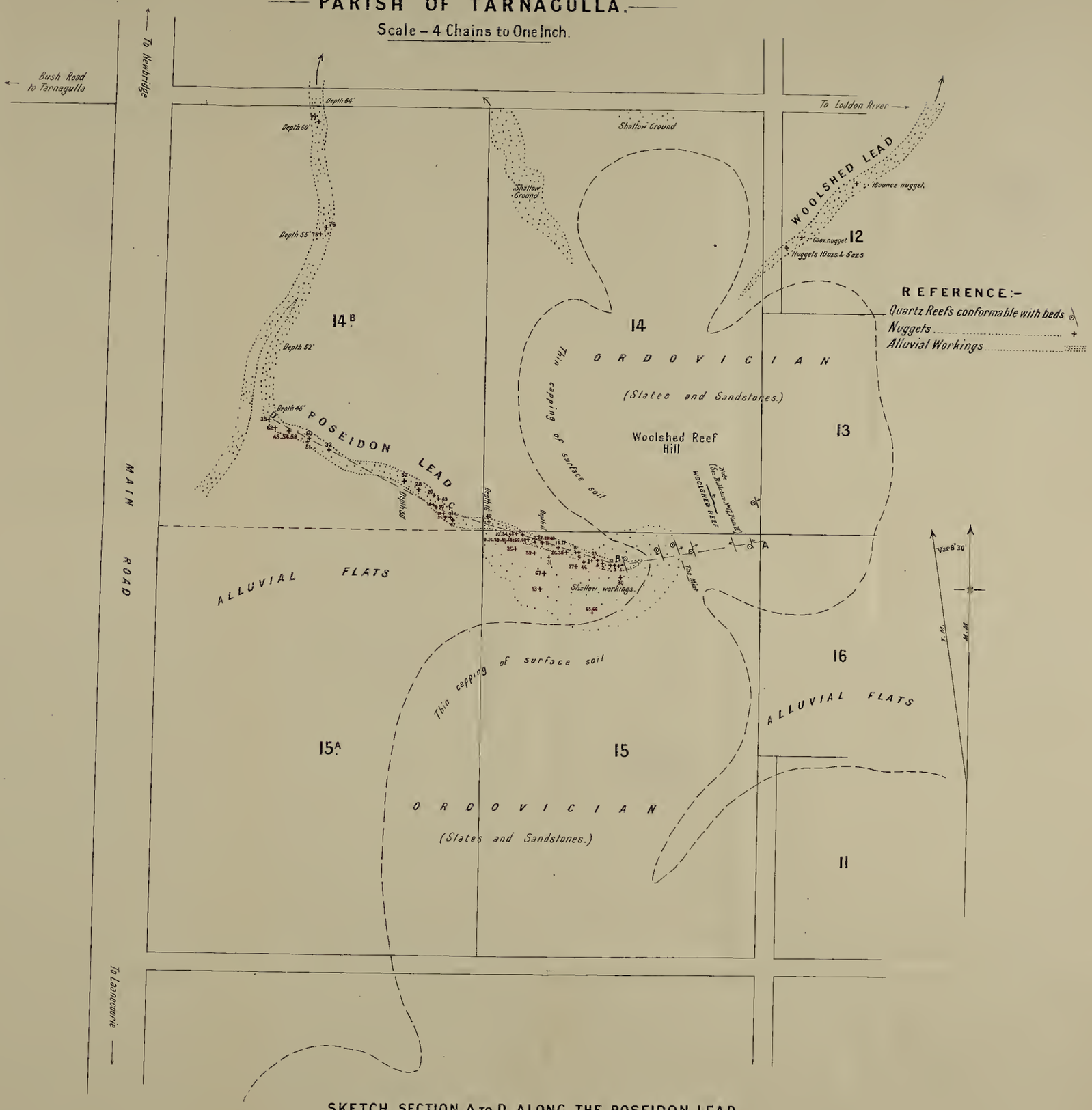
NOTE.—The nuggets are marked on the plan by red crosses and numbers corresponding to those in the list.

Yields reported up to the 25th February, 1907.

No.	Name of Nugget.	Finder.	Date	Depth.	Weight. Gross.	Weight. Net.	Remarks.
				ft. in.	oz. dt.	oz.	
65	"The Groper"	Bravo and Leighton	16.2.07	1 6	146 0	126¼	2 ft. 6 in. above bedrock. Reported 3½ chains south of the "Poseidon"
66	.. ..	Bravo and Leighton	19.2.07	1 0	148 10	..	3 feet from "The Groper"
67	.. ..	Carling and party	16.2.07	shallow	36 0	..	Between Jackson's and Gascoyne's claims
68	.. ..	Mackenzie and party	25.2.07	13 0	21 0	..	
69	.. ..	Cox and Newit ..	25.2.07	13 0	18 0		
70	.. ..	Cox and Newit ..	25.2.07	13 0	14 0		
71	.. ..	Mackenzie and party	9.2.07	13 0	12 0		
72	.. ..	Wragge Bros. ..	25.2.07	11 0	10 0		
73	.. ..	Wragge Bros. ..	25.2.07	11 0	9 0		
74	.. ..	Jackson and party	9.2.07	10 0	6 0		
75	.. ..	Baker and party ..	25.2.07	55 0	5 0		
76	.. ..	Paul and party ..	9.2.07	56 0	2 0		
77	.. ..	Glover and party ..	16.2.07	60 0	5 10 5 10 2 10		

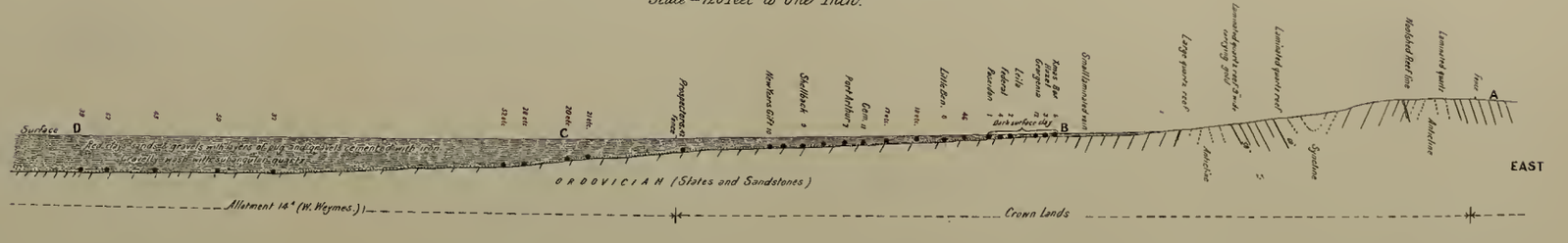
THE POSEIDON LEAD
PARISH OF TARNAGULLA.

Scale – 4 Chains to One Inch.



SKETCH SECTION A to D ALONG THE POSEIDON LEAD.
showing relative positions of Nuggets on bedrock.

Scale – 120 Feet to One Inch.



Yields from Puddling Operations.

Owner of Claim.	Depth.	Number of Loads.*	Yield in Ounces.	Date Reported and Remarks.
	feet.			
Jackson and party ..	10	18	19	1.2.07 (also 59 oz. in nuggets)
Mackenzie and party ..	13	16	14	1.2.07 (also 20 oz. in nuggets)
Mackenzie and party ..	13	12	14	9.2.07 (also 12 oz. in nuggets)
Paul and party ..	56	20	4	9.2.07 (also a 2-oz. slug)
Taylor and party ..	40	38	8	16.2.07 (this, with some small nuggets, gave 13 dwts. per load)
Phillips and party ..	39	38	19	16.2.07
Watts and party ..	45	14	8	16.2.07
Liddell and party ..	..	15	2	16.2.07
Baker and party ..	55	18	12½	16.2.07 (including a 5-oz. slug)
Cross and party ..	..	12	8½	25.2.07
Mackenzie and party ..	13	21	38	25.2.07 (including 21-oz. nugget)
Jackson and party ..	10	17	6	25.2.07

Quartz Reefs, etc.

The nuggets cannot have travelled far from their original quartz matrix which would occur in the Woolshed Hill belt. This belt shows nice pitted green and other slates and sandstones of Ordovician age, fissured with large quartz makes containing lime-soda-felspar, which indicates the close proximity of an igneous dyke that may be located later on near the Woolshed reef. I also noted this felspar in the Irvine's reef and Federation reef. These three reefs occur in the one belt. Several small laminated reefs are seen on the Woolshed Hill, and one of these named "The Mint" is being opened up with fair prospects.

The size, character, and manner of deposit of the nuggets in the alluvial clays, &c., indicate that the gold has been shed from indicators which would be crossed by separate veins or by flat veins off-shooting from large main reefs. Further work on the reefs and quartz veins should lead to a more definite theory of the origin of these large gold nuggets.

The beds of slate and sandstone are folded, and two anticlinal and a synclinal fold were noted. (See sketch section).

At Irvine's Reef, further north on this same belt, an anticlinal fold occurs and again to the north near the Gippsland syndicate's mine. These foldings were previously noted by Mr. E. J. Dunn, Director of the Geological Survey, and are referred to in Bulletin No. 17, page 5, the Newbridge Gold-field and McEvoy's Reef, Rheola. In the Woolshed belt the following reefs have been worked:—the Woolshed, the Federation, Irvine's and the Rob Roy a little further to the east; and the following alluvial leads coming from the same belt have been worked:—the Poseidon,

* A load of wash-dirt is roughly 1 ton.

Crown Lands and allotment 14[A]; the Federation, allotment 6; the Just in Time, allotment 5; the Nick O'Time, allotment 3. The above leads and reefs, with the exception of the Poseidon Lead, have been reported on by Mr. S. B. Hunter in Bulletin, Geological Survey, No. 17, 1905.

The lead will continue on through Lee's allotment 9, and will re-cross the Woolshed belt, where an enrichment should occur in the wash.

The lead will then continue on, bearing a little more to the north-east, and out through the 85-ft. ground proved by boring just below the north-west corner of allotment 8, parish of Tarnagulla. It should then junction somewhere in allotment 7 with the deeper run of ground proved in the Race-course Reserve, 139 feet deep, and then continue on towards Newbridge. (See Annual Report, 1905.)

Mr. Hunter has kindly supplied me with the boring records near the Reserve, thus enabling me to show the position of the deep ground.

Finally I may state, that at the time of my visit, the Poisedon field was well manned, and all the alluvial of value close to the rush had been pegged out.

Without doubt there is much of the country in the district which should be well prospected and which is sure to receive some attention from the miners who have not been able to obtain claims close to the rich finds at Poseidon and are now commencing to prospect to the north and south of the rush.

I must thank Messrs. Williams and Yeo and the many claim-holders at Poseidon for the assistance given to me in obtaining the records, positions, and details of the nuggets found on the field.

Nuggets at Ironbark Gully.

The accompanying plan shows some of the geological features near the head of Ironbark Gully, about three-quarters of a mile south of the post-office, Tarnagulla, and the site of the Magnum Bonum nugget discovered on 16th July, 1889. Prior to the rich Poseidon discoveries, this was the largest nugget found near Tarnagulla.

The Magnum Bonum nugget (458 oz. gross weight) was discovered in red iron-stained gravel at a depth of 4 ft. 6 in. in Ironbark Gully, opposite a small tributary gully named Tormie's. Mr. Smith, son of the discoverer of the Magnum Bonum, showed me the old shaft and enabled me to locate the site on my plan, at a point in Ironbark Gully nearly midway between the western reef and the Greeks Hill reefs on the east. (Site No. 1.)

In Ironbark Gully it was nugget or nothing, the fine gold only yielding about 2 grains to the tub.

The next in size to the Magnum Bonum was one weighing 15 lbs. (180 ozs.) found by a Welshman in 1859.

Another nugget worthy of note was found by Dunk and Hardy just below the Magnum Bonum. Its gross weight was 9 lbs. (108 ozs.) (Site No. 2.)

Ironbark Gully runs nearly east and west across the Ordovician slates and sandstones, and has its outlet to the east.

On the hill to the north I found a basic dyke 3 feet wide, running nearly north and south. It crosses Ironbark Gully, and nuggets have been found on both sides of it.

A reef known as the Cross reef, which yielded 1½ ozs. to the ton, was worked right to the dyke, and their relation to each other is shown by the presence of crystals of soda-lime felspar in the Cross reef.

NICK O'TIME LEAD

PARISH OF TARNAGULLA.

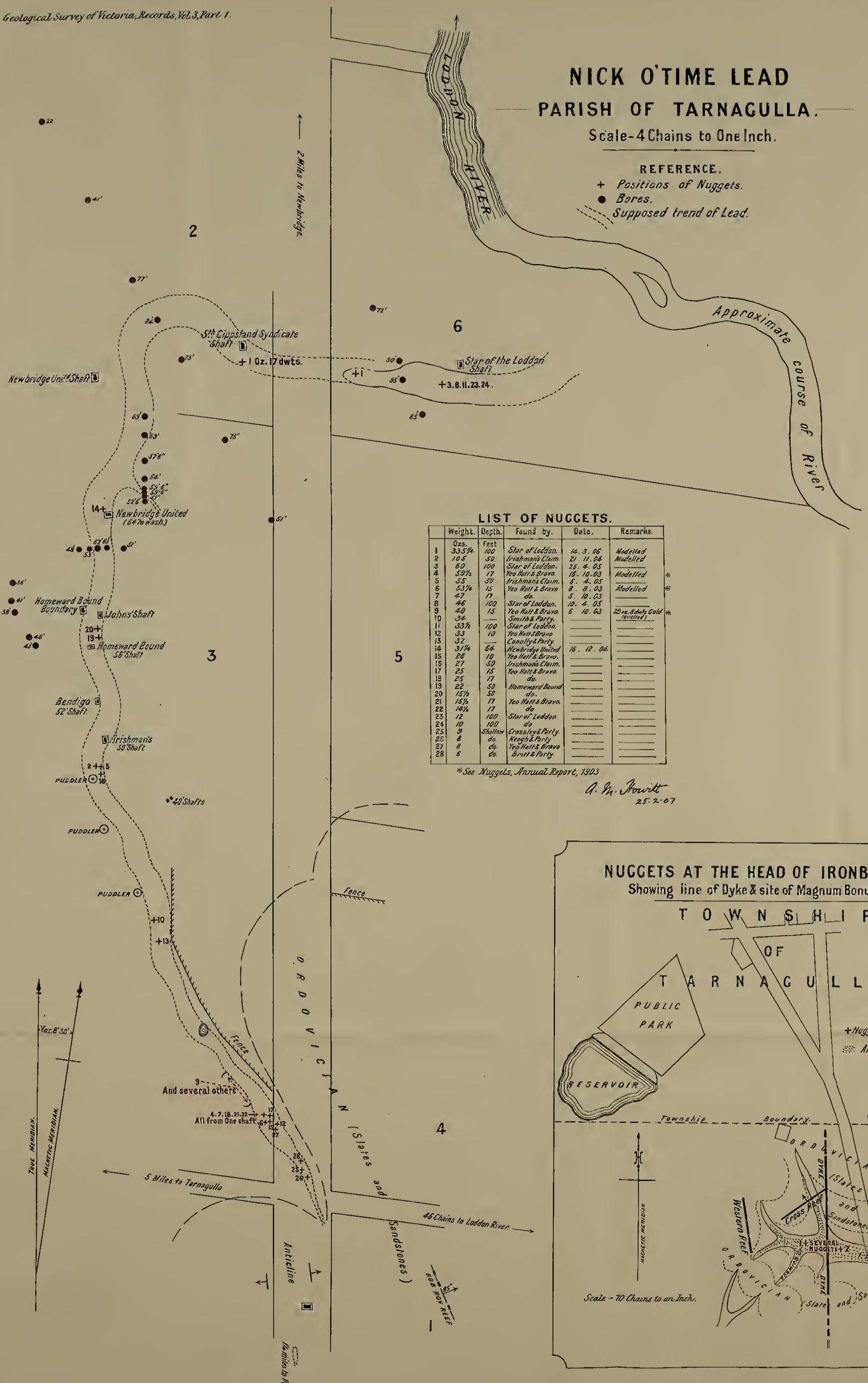
Scale - 4 Chains to One Inch.

REFERENCE.

+ Positions of Nuggets.

● Bores.

Supposed trend of Lead.



LIST OF NUGGETS.

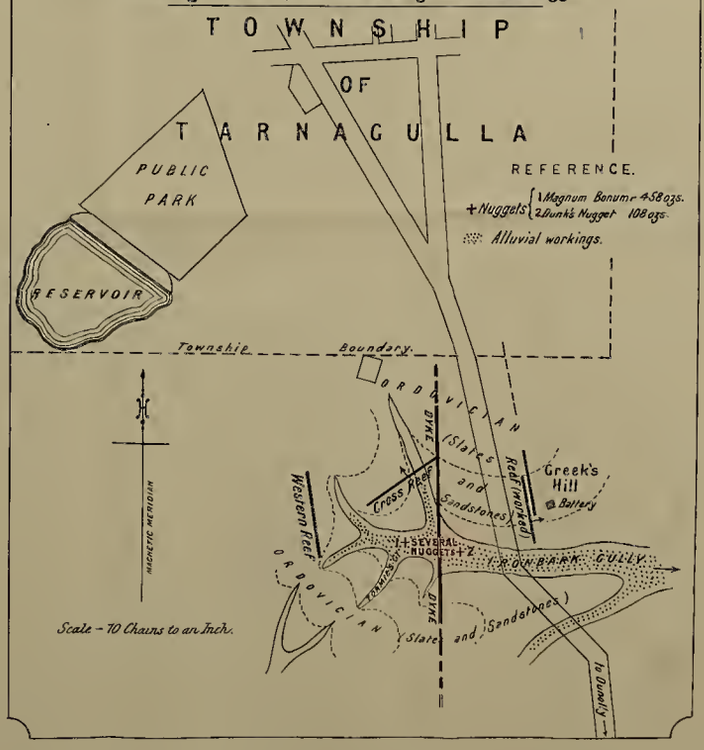
	Weight.	Depth.	Found by.	Date.	Remarks.	
	Ozs.	Feet				
1	33.5¼	100	Star of Loddon.	14. 3. 06	Modelled	
2	105	50	Irishman's Claim.	21. 11. 04	Modelled	
3	60	100	Star of Loddon.	26. 4. 05		
4	53½	17	Yeo Holt & Bravo.	18. 10. 03	Modelled	*
5	55	50	Irishman's Claim.	8. 4. 05		
6	53¼	15	Yeo Holt & Bravo	8. 8. 03	Modelled	*
7	47	17	do.	5. 10. 03		
8	46	100	Star of Loddon.	10. 4. 05		
9	40	15	Yeo Holt & Bravo.	6 10. 03	25 ozs. Edwin's Gold (smelted)	*
10	34	—	Smith & Party.			
11	33½	100	Star of Loddon.			
12	33	10	Yeo Holt & Bravo			
13	32	—	Conolly & Party			
14	31¼	64	Newbridge United	16. 12. 04		
15	28	10	Yeo Holt & Bravo.			
16	27	50	Irishmans Claim.			
17	25	15	Yeo Holt & Bravo.			
18	25	17	do.			
19	22	50	Homeward Bound			
20	15½	50	do.			
21	15¼	17	Yeo Holt & Bravo.			
22	14½	17	do			
23	12	100	Star of Loddon			
24	10	100	do			
25	9	Shallow	Crossley & Party.			
26	8	do.	Keogh & Party			
27	8	do.	Yeo Holt & Bravo			
28	6	do.	Britt & Party.			

*See Nuggets, Annual Report, 1903

A. G. Howitt
25.2.07

NUGGETS AT THE HEAD OF IRONBARK GULLY.

Showing line of Dyke & site of Magnum Bonum nugget.



NATURAL

This example of a cross reef related to the dyke may occur at other points along the line of dyke intrusion, and any gullies to the north and south crossed by this dyke would be worthy of prospecting if not already worked.

The large nuggets were probably shed from rich veins crossing indicators, but the occurrence of this class of igneous dyke is an additional guide to the presence of gold-bearing reefs and veins which would be associated with it.

[*Report sent in 8.3.07.*]

GOLD REEFS IN THE VICINITY OF THE OLD CEMETERY, BALLARAT.

By W. Baragwanath.

The country in the vicinity of the old cemetery at Ballarat is occupied by Ordovician rocks covered by a varying thickness of soil and surface deposits. The westward extension is buried beneath basalt, while to the north an extensive area of recent deposits obscures the underlying bedrock. Eastward the surface levels fall to the depression in which Gnaw Creek flows, while southward the margin of the exposed Ordovician is flanked by basalt. Lake Wendouree occupies portion of the south-western corner of the area. Numerous patches of scattered quartz occur, and in places, as in the old cemetery, quartz reefs are exposed. The southern portion of the area is for the greater part built upon, and gardens, &c., obscure the original surface features. North of the railway line there are paddocks in which scattered outcrops of quartz show. The area offers exceptional inducements for reefing for two reasons, the first being that of position along the extension of a favorable belt, and the second the rich alluvial gold derived from the denudation of material in the vicinity.

As regards the position of the area, it will be noticed that it occupies the northern extension of the Sebastopol Plateau belt, a belt famous not only for the richness of the alluvial, but also for its quartz mines during the last half century.

On the Sebastopol Plateau three quartz reefs have been exploited. The Consols lode was worked from the outcrop under the basalt to a depth of 2,000 feet with profitable results. An endeavour is now being made to locate the reef in the South Star mine at a depth of 3,000 feet. The auriferous portion of this lode, as worked, extended over a length of $1\frac{1}{2}$ miles. East of the lode, in shallow levels, rich spurs and veins were worked to a depth of 600 feet.

A quarter of a mile to the west is the Guiding Star line of lode. Payable returns were obtained from this line for a length of $1\frac{1}{4}$ miles. About a quarter of a mile further west is the Albion lode. This reef has returned payable results in the Star of the East No. 2 shaft and Band and Albion No. 4 shaft.

A popular belief exists among many on the field that the northern extension of the Sebastopol Plateau belt of country terminates against a cross course which is also credited with the loss of the Ballarat East belt of country at Black Hill. That this is a fallacy may be easily proved in the case of the Ballarat East field, and as regards the Ballarat West portion, we have instances of the existence of auriferous quartz north of the supposed cross course. Of these perhaps the most significant was met with in the old Kohinoor shaft, where from the cap of a reef, still left intact, a nugget of gold weighing 834 ozs. and attached to a slab of quartz was obtained. Two

smaller lumps of 700 and 312 ozs. respectively were obtained from the same neighbourhood. (I am indebted to Mr. F. D. Johnston for the above information.) This shaft was situated on the south side of Urquhart-street between Ascot and Ripon streets. On the east side of Pleasant-street, on both sides of Sturt-street, auriferous quartz reefs were met with in the Sir William Don and Great Republic companies' alluvial workings. These reefs, although low grade—$3\frac{1}{2}$ dwts. where tested—were worthy of further exploitation. Again, in Sturt-street the Township reef yielded auriferous quartz in the early days of quartz mining in the district, but no work was done to prove it at a depth.

The following extract is taken from Woods' appendix in Brough Smyth's *Gold-fields and Mineral Districts of Victoria*, page 485:—"During the time the Allied Armies Company were driving for the Inkerman lead, they discovered a quartz reef but did not work it to any extent. In October 1862 a company was formed, under the style of the Emerald Company, for the purpose of working the reef. At the outset they obtained some very rich quartz, but the yields fell off, and on the whole the reefs were not remunerative, and the company was wound up on the 10th December, 1863." This appears to be the only attempt made to work the reef.

Within the area under notice several lines of reef have from time to time been located but, although favorable yields have been obtained, no attempt to work at a depth is apparent.

Dealing with the second reason why the area is deserving of prospecting, the following information, culled principally from Smyth's *Gold-fields and Mineral Districts of Victoria*, might be added.

From the exposed Ordovician in the neighbourhood of the cemetery three distinct leads were traced, viz., the Essex lead running away to the north-west, the Swamp lead running westerly, and the Inkerman lead with its tributaries running first southerly, then westerly.

Of the first two leads little need be said. They appear to have soon left the auriferous belt of country. They both carried gold, but water and other difficulties rendered working unprofitable.

The most northerly branch of the Inkerman lead, the A1, was opened in July, 1857, and returned the prospectors £3,200 after paying expenses. The Homeward Bound Coy., the next on the lead, returned £14,800 after paying expenses. In the next claim a tributary lead was discovered which was named Bridget's lead, and was traced from the A1 lead to the Cemetery quartz reef on the west side of the cemetery. The party working this lead obtained £4,000 clear of expenses. The next claim was the Junction; a party of eight men worked out this claim in ten months and divided £7,200 after paying expenses.

The Haphazard lead, a tributary to the Inkerman lead, was traced from its source, the Cemetery quartz reef, to the Inkerman a distance of 1,600 feet. Some portions of it were rich.

The Inkerman lead above the junction of the A1 lead was very poor but much richer below the junction of this lead. The Allied Armies Company occupied Green's paddock on the east side of Drummond-street, between Creswick-road and Webster-street. This company, over an area of 3 acres, worked the wash to a height of 30 feet from the bed-rock. From three years' work the party obtained £101,350 worth of gold. It was during this company's operations that the reef, subsequently known as the Emerald, was disclosed. The Ophir Company, the next on the lead, did not furnish any returns of their yields. The Independent Company, between the Ophir and the Great Republic, divided, after paying expenses, £34,100. The Great Republic Company, which worked

the Inkerman lead as far west as Pleasant-street, paid £88,118 in dividends. The National lead entered the Inkerman lead from the north, under Pleasant-street. The washdirt in places was very rich. To sum up, from the alluvial mines over an area of under 1¼ miles in length, dividends to the value of over a quarter-of-a-million pounds were paid. The leads following along the general direction of the lines of reef were the richest. Probably very little of the gold in the lead was derived from the easterly tributary, Bullock Gully. It therefore seems conclusive that this rich deposit of alluvial gold was derived from the denudation of quartz reefs in the immediate vicinity, and on the continuation of the Sebastopol Plateau belt of auriferous country. Apart from the attempt made by the Emerald Company in 1863, near the corner of Webster and Drummond streets, and a few prospecting claims adjacent to the cemetery, the reefs, which shed this considerable amount of gold, have been left unprospected. Mr. Clinton, the manager of the Ballarat West Gold Mining Company—the last company to work near the area—has kindly allowed me to examine his plans of the mine, which was situated on the eastern side of Hotham-street, north of Mills-street. From this shaft an auriferous vein, associated with others not proved so, was cut about 200 feet west of Drummond-street, but owing to breaking into alluvial working, and the company ceasing work, nothing further was obtained as to its value or continuity. I was informed that during pipe-laying operations by the Water Supply, auriferous loams were obtained north of the show yards.

To prospect the area under present conditions offers considerable difficulties on account of private property and civic restrictions, but from a point immediately north of the railway line, and, say, about 20 chains west of the Creswick-road, a suitable site for a prospecting shaft might be obtained, from which, at a depth of, say, 100 feet, crosscuts could be put out cheaply east and west, and these would, in all probability, lead to the discovery of auriferous quartz, the existence of which is hardly doubted.

The following information from the reports of the mining registrar may be added :—

Quarter ending June, 1879—"On the Cemetery Reef, Ballarat West, three claims have been registered, viz., The Albion, Wendouree, and Box and Co."

Quarter ending June, 1880—"A company known as the Wendouree Company, late Box and Party, obtained from 40 tons of quartz the handsome yield of 13½ dwts. per ton, which has been regarded as highly satisfactory considering the lode is 7 feet wide. The Reporter Company, Rogers and Party, A1 and Inkerman Company, Happy Land, and several others, are vigorously at work in the same vicinity."

Quarter ending March, 1881—"The Wendouree Company, Ballarat North, has struck a reef 5 feet in thickness, showing gold freely, and containing large quantities of galena, iron pyrites, &c. The Reporter Company, the adjoining claim north, has opened a chamber to cut the reef, having sunk their shaft to a depth of 375 feet, passing through several leaders dipping west, each gold-bearing, and varying in width from 6 inches to 2 feet."

Quarter ending 30th September, 1881—"I cannot report that much gold has been obtained by the claims working on the north side of Lake Wendouree, viz., The Wendouree, New Essex, and Reporter companies, but they are prosecuting their operations with vigour."

[*Report sent in 27.5.07.*]

THE BAND AND LOCH, NEW KOHINOOR, AND SEBASTOPOL PLATEAU No. 1 MINES, BALLARAT.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The Band and Loch Mine.

The operations at the Band and Loch mine are now confined to the No. 9 shaft of the former Band and Albion Company, which amalgamated with the Sir Henry Loch and formed a company under the style of the Band and Loch.

The lowest level is at 2,300 feet, and from this level operations have been directed to the development of the Consols line of lode. This line of lode was worked with profitable results to a depth of over 1,800 feet from the Sir Henry Loch shaft. An examination of the mine plans shows that at least two distinct shoots of payable stone occurred in this lode. One, the cap of which was found in the New Kohinoor Company's mine, pitched southerly, and passed through the Sir Henry Loch ground, the Band and Albion, past the Nos. 7 and 10 shafts and through the Star of the East Company's No. 1 shaft workings, in all having a length of about a mile, and reaching at the point last worked a depth of 2,000 feet below the surface. Another shoot of payable stone was worked in the Sir Henry Loch Company's ground to a depth of 1,800 feet, the make, although the reef had a well defined westerly underlie, appearing almost vertical, *i.e.*, without any pitch to the north or south.

At 1,900 feet in the No. 9 shaft a crosscut was put out easterly for 875 feet, and a drive northerly on what appears to be the lode track. At 630 feet north of the crosscut a blind shaft, equipped with an air winch, was sunk to a depth of 180 feet. Five hundred and eighty feet north of the blind shaft on the 1,900-ft. level, a payable shoot of stone—the downward continuation of that formerly worked by the Sir Henry Loch Company—was met with. The lode averaged about 4 feet in width, and was stoped upwards to the 1,830-ft. level of the Sir Henry Loch. From the bottom of the blind shaft a drive (the 2,080-ft. level) was put in north, and the payable shoot again intersected. Here the lode is of large dimensions ranging up to 60 feet in width, and there are large spurs further west. The eastern wall of the lode has a well defined westerly underlie, and agrees with that proved throughout the Sir Henry Loch workings. Intermediate levels for stoping were opened between the 1,900 and 2,080 feet levels, in each of which large bodies of stone were exposed and profitable crushings were obtained therefrom. An interesting feature, and one which has been carefully noted by the manager, is the occurrence of pyrite seams and black slate beds analagous to the Ballarat East Indicators. Professor Gregory* compares them to fahlbands, but states that they are too short and irregular to be entitled to rank as such. Although my visit, on account of the extensive nature of the workings, was necessarily incomplete, sufficient evidence was obtained to show that for several hundreds of feet these bands have been partially exploited, and a number of veins, some of large dimensions, and yielding up to 5 ozs. to the ton, found to occur.

Similar bands, probably in the same zone of country, are to be seen in the Kohinoor mine in the north where there is evidence of repetition of the beds by folding. Very rich spurs were worked during the '80's in shallow levels by the Washington Company and a number of freehold companies, and similar pyrite seams and black slate beds were noticed and recorded on the mine plans.

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* Memoirs of the Geological Survey, No. 4. The Ballarat East Gold-field, 1907, p. 13.

At the 2,300-ft. level a crosscut was put out easterly from the main shaft. At 780 feet from the shaft a drive has been put in northerly for a distance of 1,600 feet. From this drive crosscuts have been put in easterly for lengths of about 100 feet, and at 950 feet north, a crosscut put out westerly for 330 feet intersected a spurry formation. On this formation drives have been extended north for 223 feet and south for 134 feet. In the north drive large bodies of stone are exposed, but the ore is very low grade.

At 1,475 feet along the north drive a rise is being put up to connect with the 2,080-ft. level. A good wall is being risen on; for the first 30 feet the wall has an easterly dip; then is becomes vertical and finally assumes a westerly dip. At the time of visit the rise was up a total height of 174 feet, and the appearance suggested a shoot of stone coming in with a northerly pitch.

Assuming the lode to continue its general westerly underlie from the 2,080-ft. level downward, it appears that the rise is being put up on a vertical dropper and that the lode will be cut by the rise. A large quantity of water is making at the 2,080-ft. level, whereas the top of the rise (within 60 feet of the level) is dry.

West of the shaft crosscuts have been driven to the Guiding Star line of lode. This lode is 1,320 feet west of the Consols line.

To form an idea of the reef formations and the correct relationship to the strata, &c., would require an extensive survey. From its position and the former records of the parent company, such a survey would be advisable, as the mine is situated in what was originally the richest locality in Ballarat.

[*Report sent in 4.7.07.*]

The New Kohinoor Company.

The crosscut now being driven east from the shaft is at a depth of 850 feet from the surface. The country passed through consists of sandstone and slaty beds of grey colour. They dip east for 190 feet from the shaft to a syncline and then dip west for 275 feet, where a minor anticline occurs; 60 feet further east there is a minor syncline and 50 feet still further east is the principal fold or anticline, at 575 feet east of the shaft; 60 feet to the east of the main axis is a minor syncline and a short distance beyond the present face, which is 680 feet from the shaft, another minor anticline may be met with. The country passed through is remarkably free from quartz. It occurs at two or three places as spurs, but at the main anticline (575 feet in) there is a quartz vein which follows the arch over the fold. It is about 12 inches thick, and although it occurs in the same position as saddle reefs, it is not quite clear that it corresponds with them in being between the bedding planes. If the legs were followed down a few feet and they were found to be conformable with the bedding then it could be considered a saddle reef. The section exposed in this crosscut clearly shows that in this portion of the Ballarat field a structure prevails akin to that found at Bendigo, and that a succession of anticlines and synclines can be made out. Mr. Baraganawath, jun., has completed a section of this crosscut (Pl. IV.), and if the Western crosscut, 100 feet nearer to the surface, is open he will also make a section of it.

At the surface of the bedrock, right over the present end of the crosscut, it is stated that rich alluvial gold was obtained, and quartz workings at a higher level than the crosscut furnished the reason for driving in this direction.

So far as the present information goes, the anticline 575 feet from the shaft appears to be the main axis, and good work would be done by boring below the level of the crosscut in centre country. A rise might be useful, but on the whole it would be far preferable to test the beds at a lower level, as they would all be new country, and the beds so far disclosed appear to belong to the Castlemaine zone and a rise would be in them only.

[*Report sent in 21.5.07*].

The Sebastopol Plateau No. 1 Mine.

At the Sebastopol Plateau No. 1 mine, an alluvial lead was formerly worked, and in the course of removing the auriferous wash, gold-bearing quartz was discovered, and the mine has since been worked for quartz. The lower levels are filled with water.

At the 200-ft. level, a crosscut has been run out easterly for 260 feet. The country dips west at the shaft; at 30 feet east from the shaft an anticline occurs and at 50 feet east of the shaft an east "leg" has been worked. The quartz is 2 inches thick, and it has been stoped down to the 280-ft. level. From centre country on the anticline to the end of the east crosscut the country dips east.

At the 280-ft. level the counry dips west from the shaft for 70 feet in the west crosscut, and there a syncline occurs. This syncline pitches north at 8 deg. Along the syncline a body of richly auriferous quartz that appears to have been a trough reef was worked in a southerly direction for 700 feet to the boundary of the lease. The east leg of the trough reef was worked for 30 feet above the level. Spurs of barren quartz also occurred along the course of the syncline. Mr. Johnson, the manager, informed me that 100 tons of the quartz from the trough reef yielded at the rate of 8 ozs. of gold per ton.

At the 378-ft. level, in the crosscut west from the shaft, the beds dip west for 70 feet. At this distance a syncline occurs pitching north at 8 deg. The level is driven for 200 feet south of the crosscut along the west leg of the trough reef. The quartz is from 6 to 18 inches thick, and through it copper pyrites is freely disseminated in pieces up to an inch and more across. Galena and zinc-blende are also present, but only traces of gold. Northward the level has been continued for 1,460 feet without cutting payable gold-bearing quartz.

It is evident that in this mine the slates and sandstones of Ordovician age are bent over anticlinal and synclinal axes in the same manner as at Bendigo. Auriferous quartz reefs occur along the anticline and the syncline. In the 200-ft. level a "leg" on the east side of the anticline was worked down to the 280-ft. level. In the 280-ft. level, a trough reef was worked along the syncline with profitable results. Still lower down in the 378-ft. level, another trough reef has been prospected, but it is not profitable to work. Even to this shallow depth the ground has not been thoroughly explored. The shaft is sunk to over 1,000 feet, and very little prospecting has been done.

To test the value of this mine, winzes should be sunk in centre country, both in the anticline and in the syncline. The shaft should be also deepened and crosscuts made east and west for the purpose of locating the anticline and syncline.

[*Report sent in 3.10.07.*]

SECTION ALONG EAST CROSSCUT 850 FEET LEVEL.

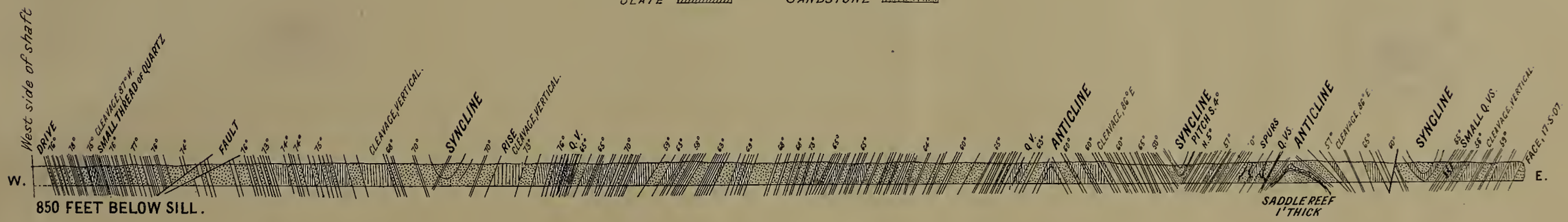
NEW KOHINOOR MINE.

SHOWS ANTICLINAL AND SYNCLINAL FOLDING.

SCALE — 60 FEET TO 1 INCH.

REFERENCE.

SLATE SANDSTONE



BRIT. MUS. NAT. HIST.
NATURAL HISTORY

THE DAYLESFORD GOLD-FIELD.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The survey being made of the anticlines in the Daylesford district shows that the Ordovician strata are bent into a series of anticlines and synclines. The strike of the axial lines is about N. 25 deg. W. (mag.). A very accurate geological map of this area was made by the late Mr. Norman Taylor, and when the anticlines are inserted on this, and the alluvial workings are also laid down, a most valuable guide for the development of the quartz reef resources of this district will have been prepared.

In a width of 5 miles N.E. from Hepburn, 37 anticlines have been already located. The rocks consist of slates, mudstones, and sandstones, with occasional bands of grit and of quartzite. They appear to belong to the upper portion of the Castlemaine zone, and to still higher beds. Graptolites occur that correspond with those in the Castlemaine zone. In colour the rocks are generally grey, with grey soil, except at and near the anticlines, where the lower beds are brought up to the surface. Along portions of the anticlines the rocks are of yellow colour, with yellowish soil, in places of a reddish tint, the soil corresponding in colour. Some dykes occur near the anticlines, and others occur crossing the strike of the beds. They are generally so decomposed that their true character is not discernible.

Daylesford was formerly celebrated for its rich alluvial deposits, which cover a wide area of country. The relation of these auriferous alluviums to the anticlines is being determined. Although so many anticlines have been located it does not follow that saddle reefs also occur, and except in one or two cases these have not been noticed. It is quite possible that where the same anticline passes through one zone or horizon, the rocks may be of such a nature as not to be favorable to the formation of saddle reefs, while at another horizon, or different zone in the same anticline, the beds would be favorable, and saddle reefs would occur.

Mitchell's shaft (Cornish United Mine) at 720 feet is in centre country, or right on the anticline. The old Cornish lode is cut at 150 feet E. In the cross-cut, the reef is dipping W., and crossing the beds which dip E. Along the reef 43 feet N. of the cross-cut the mixed quartz and slate is 3 feet thick. Iron pyrites is abundantly present.

At the 550-ft. level 50 feet S. of the shaft and overhead, a group of spurs, which closely simulates a true saddle reef, is being worked along the anticline. In places a spur will follow between the beds for some distance, and the quartz is laminated as in genuine saddle reefs and the legs from them, but in other places the spurs cross through the slate beds, and through the sandstone bed, which is just below the group of spurs. The spurs are being worked for a width of about 6 feet, and to a height of about 4 feet, and the whole of the material is sent to the crushing plant. The anticline pitches southward at angles ranging from 7 deg. to 17 deg. These spurs are worked above the 535-ft. level, and down on the pitch below the 560-ft. level. There are no proper "backs" from this group of spurs, and no "legs" extending downwards from them. This group of spurs is of unusual character, and accentuates the importance of centre country from a mining stand-point.

Below the spurs is a bed of hard sandstone, while above them are thin alternating beds of grey and black mudstone that are contorted and serrated in cross section through compression.

The results obtained from quartz mining in this district are such as to warrant the belief that if capital is judiciously applied in sinking deeper, the industry will greatly expand, and prove to be remunerative. The mines that are doing the pioneering work will afford valuable data for those that follow, both as regards the conditions under which auriferous quartz occurs, and the best manner of seeking for such occurrences.

Indicators are a distinct feature in this district, and much of the coarse gold found in the alluvial workings is due to their influence. One of these occurs at the head of Welcome Gully, and was discovered by Messrs. White and Jackson. Welcome Gully was famous for the rich returns of gold won from it by the alluvial workers. Towards the head of the gully very coarse gold, ranging up to 30-oz. pieces, was not uncommon, and an effort was made to locate its source. Messrs. White and Jackson were successful in this, and from the intersection of an indicator with a quartz vein of from ½ inch to 1 inch thick occupying a cross fault, about 1,000 ozs. of coarse gold was obtained in a depth of about 40 feet from the surface downwards. The indicator conformed to the bedding of the country rock, and was about ½ inch thick. Except at the intersection, very little gold occurred, and, although the indicator has, since the discovery in 1894, been driven on for 400 feet northward, and 300 feet southward, and found to intersect other quartz veins, no payable gold has been struck.

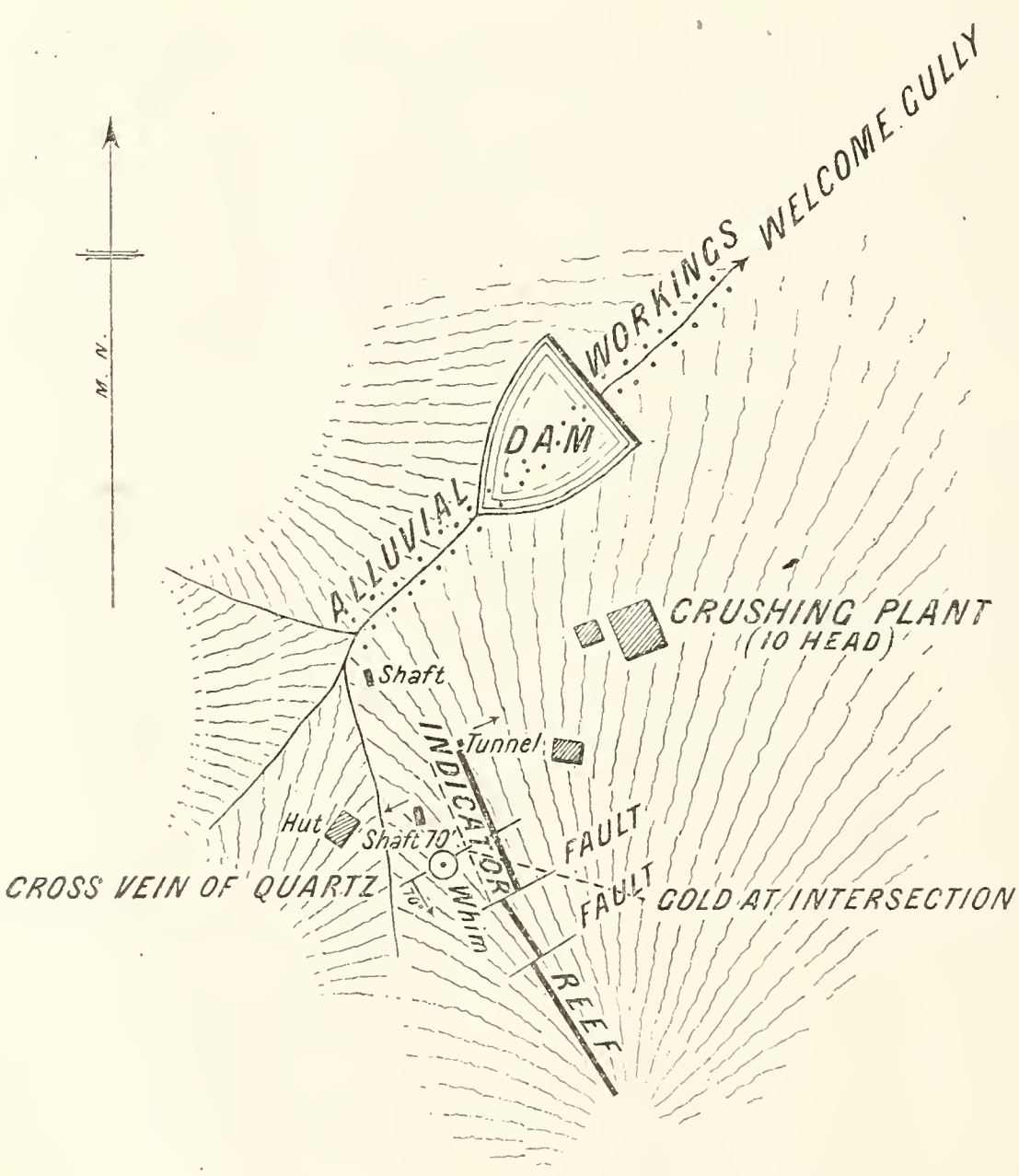


FIG. 4.

White and Jackson's Indicator. Plan.

The country rocks are grey and yellow sandstone, slate, and mudstone, with some black slates. The strike is about N. 25 deg. W.

A strong quartz reef shows close to the mouth of a tunnel, and this has a general strike of about N. 25 deg. W., but it is faulted at 2 chains from the tunnel, and thrown westward (going S.) for about half-a-chain. About another chain southward it is again faulted in the same direction, but not so far. The reef is about 4 feet thick, but numerous spurs penetrate the adjacent country rock.

This reef appears to be about on the line of anticline, as the country to the E. of it dips E., and to the W. it dips W. A shaft has been sunk 70 feet, and a whim erected. The country here dips W., and consists of alternating thin beds of slate and sandstone of grey colour. The indicator is about 24 feet E. of the shaft. The pitch of the country is southward at 23 deg. At the bottom of the shaft a cross-cut east is extended for 30 feet and then the level is driven southward. At 40 feet along this level a quartz vein $\frac{1}{2}$ to 1 inch thick and dipping south at 70 deg. crosses the country. It was at a higher level where this vein intersected the indicator that the coarse gold was obtained. As the pitch of the beds is southward the same beds would be encountered in that direction at a greater depth, and if another quartz vein was intersected, the conditions would be similar.

At 150 feet south of the shaft a cross-cut is driven in east about 30 feet, and it seems to be approaching centre country, to which it should be continued. The intersection of the beds in which the indicator occurs with the large quartz reef should also be sought.

As the pitch of the country is so considerable it should bring the deeper beds towards the surface in a northerly direction.

It is observable that the reef is faulted and disturbed, but whether there are quartz veins on these faults is not known. If there is quartz at these faults the intersections with the indicator should be tried.

Many of the rich alluvial gullies around Daylesford probably owe their coarse gold to the presence of an indicator in close proximity to where the gold was found.

[*Report sent in 18.9.06.*]

THE FOREST CREEK GOLD REEFS AND THE FRANCIS ORMOND MINE, CHEWTON.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The Forest Creek Gold Reefs.

The Forest Creek Reefs mine is situated about one mile a little west of north from Chewton. The country rocks are Ordovician slates and sandstones belonging to the Castlemaine zone. The underlying Bendigo zone is exposed along the Chewton railway line to the south of the mine and it pitches northward, and consequently the Bendigo zone is below the present workings. All the work so far done has been in country east of centre country. Only in one west cross-cut has centre country been cut. This centre country is on the Wattle Gully line of reefs, and in the old workings of the Wattle Gully mine, 2 miles to the south, extremely rich spurs were formerly worked in eastern country and in the Bendigo zone. There is, therefore, reason to expect similar results when the mine reaches deeper levels and gets into the Bendigo zone.

The shaft is 10 ft. x 4 ft. in three compartments, and is sunk to a depth of 760 feet. It is sunk about 190 feet east of the anticline or centre country. It is probable that the plane of the anticline will be either nearly vertical or slightly inclined to the west, so that, as the depth of the shaft increases, the cross-cuts to centre country are likely to be a little longer. The cross-cuts so far run out west support the opinion that, like the Chewton anticlines, the trend is to the west as depth increases.

In No. 4 level (237 feet below the surface) centre country was cut at 190 feet west from the shaft. At No. 10 level (685 feet) the west cross-cut was driven 203 feet without cutting centre country, although it is probably within a few feet of the face.

There are two sets of "backs" or "walls" in the mine that originate at centre country. The one set dips east and the other set dips west. Although the arch at No. 4 cross-cut is well formed, no attempt has been made to prospect centre country by winzes below No. 4 level.

From Nos. 1, 2, and 3 levels considerable bodies of spurs were worked. From No. 4 level spurry country north of the cross-cut was extensively worked.

At No. 6 level, 371 feet from the surface, the west cross-cut has been driven for nearly 200 feet, but centre country was not reached. In No. 8 level the spurry quartz was worked for a width of 30 feet in places. No work was done at No. 9 level.

At No. 10 level, 685 feet from the surface, the west cross-cut is 203 feet long and passes through east country all the way. The rocks are slates and sandstones, with slate in the face. A level has been driven northward from the cross-cut and the spurry country on the main wall has been worked for a length of 500 feet and to widths ranging from 10 feet to 40 feet. Southward from the cross-cut a level has been driven for 300 feet and the spurry country worked for that length and to a width of 10 to 15 feet. The pitch of the country is about 6 deg. to the south and the pitch of the gold shoot corresponds. The whole width of the spurry country was broken down, the slate and sandstone were picked out, and all the quartz sent to be crushed. At the intermediate level above No. 10 level the spurs were worked to a width of 40 feet in places. Iron pyrites, galena, and zinc blende occur disseminated through the quartz spurs. The gold occurs as fine particles and is worth when smelted about £4 per oz.

The body of spurs worked in the lower levels is bounded on the east by a well-marked wall. On the west the spurs taper out into the country and there is no foot wall. The strike of the east wall is about the same as that of the country, and the dip ranges from about 35 deg. to 55 deg. At No. 10 level the east wall dips E. 45 deg. At No. 11 level it dips E. 54 deg.

At No. 11 level, 760 feet from surface a cross-cut is driven 179 feet west. At 100 feet in, the spurry country is about 30 feet wide. The pitch of the country is northward for some distance, then southward at a low angle. A winze connects Nos. 10 and 11 levels at 300 feet north of the cross-cut.

At this mine the workings hitherto have been in spurry country east of the centre country and in the Castlemaine zone. Centre country has not been prospected for saddle reefs. The proper policy to be pursued is to sink the shaft vigorously so as to reach the more productive Bendigo zone, and not to do much cross-cutting until that is reached. The mine is in its infancy and there is every reason to expect that saddle reefs will occur at lower levels, also that the spurry country east of the anticline will be richer when the Bendigo zone of country is reached than it has been in the Castlemaine zone so far worked.

Mr. Ebbot, mine manager, supplied the following particulars of the present company's yields, &c.:—

Quartz crushed	...	...	23,703 tons.
Gold yield ...	...	...	6,245 oz. 12 dwt.
Value of gold	...	...	£25,372 15 0
Value of pyrites sold	...	...	3,504 14 6
Total value of quartz crushed		...	£28,877 9 6

Auriferous Spur at Chewton.

At the 100-ft. level in Dyason's shaft on the north side of the creek, at Chewton, some very rich specimen quartz has been recently obtained from a quartz spur, which cuts nearly horizontally through the slate and sandstone beds, but which pitches south. The gold occurs in pieces up to and exceeding 1 oz. in weight in solid compact white quartz with ferruginous stains on the outside, and it is of very high quality. Where the quartz was richest in gold the quartz spur is about 2 inches thick, but above and below it are 2 to 3 inches of soft material, consisting of angular quartz particles, with a minute quantity of clay which causes them to cohere. Whether this siliceous material is a quartz vein in process of formation or not is not clear. Auriferous spurs have been worked in this ground for the past 40 years, but not in the particular band of rock in which this rich quartz has been found, and now it will be necessary to explore to the surface and below the 100-ft. level in this particular band of sandstone for a repetition of quartz spurs and also to work those now found further north and south.

The Francis Ormond Mine.

The Francis Ormond mine is situate at the township of Chewton. The shaft is sunk to a depth of 1,236 feet to the bottom level.

At the 820-ft. level there is a cross-cut to the west. In 80 feet from the shaft the "main back," which is a nearly vertical fault, is cut. Black carbonaceous material and dark clay occur in the fissure. At about 20 feet further west from the shaft is the "main reef," a series of spurs, consisting of quartz veins running up to 10 inches thick, but generally thinner, enclosed in slate country. The slate and quartz spurs are from 7 feet to 14 feet across. The pitch of the country is N. at 6 deg.

Sixty feet east of the shaft and running northward is a series of flat spurs that have been worked for some distance. These spurs dip to the south-west. The country is slate and sandstone, and the flat spurs are richer in gold where they are in slate than where they are in sandstone. In places the quartz is very rich in gold. These spurs are being worked at a distance of from 250 to 300 feet east of centre country. There remains a great deal of prospecting work to be done in this mine before the extent and relative positions of the spurry country of an auriferous nature will be determined.

At the 1,030 foot level the "main back" is 90 feet west of the shaft. The dip of the fault is W. at 85 deg. The country rock is slate with a nearly vertical dip, but inclined to the east. At 130 feet west of the shaft the main body of spurs occurs. The width of the quartz spurs and

slaty country that carries a little gold is about 5 feet. The pitch of the country is slightly to the southward. The total length of the cross-cut to the east is 150 feet at this level.

At the 1,236-ft. level the cross-cut west is 355 feet long. The "main back" or fault is 80 feet from the shaft, with spurs further west. Centre country occurs at 343 feet from the shaft.

When sinking at 520 feet from the surface, a thin flat spur, about an inch thick, was cut, and from the stone obtained over the floor of the shaft and amounting to about 2 tons of quartz, 210 ozs. of gold was obtained, so Mr. Veale informed me. The gold from this mine is worth £4 1s. 3d. per oz. At present about 200 tons of quartz per fortnight is being crushed, yielding between 3 and 4 dwts. per ton. Four dwts. of gold per ton would pay well, as the battery is at the mine.

This mine has two separate directions in which to carry on exploratory work—in spurry country and at centre country. The spurry country has been a feature on this Chewton line of reefs, and for over 6 miles at intervals such country has been worked on the east side of the anticline or centre country, and a great deal of gold has been won from these eastern spurs. As there are many intervals along the line where no mining has been done, there is room for considerable prospecting for these spurs. Rowe Bros.' wonderfully rich mine at Fryerstown was on the eastern spurs of this same Chewton line.

It is a remarkable feature that auriferous spurs so frequently occur in eastern country at varying distances to the east of the anticlines and at varying horizons in the strata. It would be of great value to mining if the relative stratigraphical position of the zones in which profitable spurs have been worked could be determined. Then the relations of auriferous spurs to the anticlines and synclines require to be determined.

Bendigo affords the field best suited for working this matter out, but even the Chewton line of anticlines would afford some useful information if the pitch along its course were laid down and the relative positions of the extensive workings on eastern spurs were set out. Such a work might explain why there are such gaps between the workings on these spurs and why the workings have been carried on where they now exist.

Quite distinct from the field for prospecting afforded by the spurry country is that presented by the anticline itself and the Chewton anticline offers particular inducements for prospecting as the country is favourable and where the centre country has been opened up auriferous saddle reefs have been disclosed and worked. In the Francis Ormond mine centre country has only been cut at the 1,236-ft. level, and owing to the pitch northward of the beds this appears to be about on the top of the zone that should be productive in gold. This bottom cross-cut to centre country which lies 343 feet west of the shaft is well suited for a centre country bore, and I would recommend that a bore should be put down to a depth of, say, 1,000 feet or as far as the drill could be kept in centre country. This is the best means offering for proving the value of the mine at a small cost. If the drill cuts auriferous reefs, arrangements can be made to work them; if it does not cut any reefs to a depth of, say, 1,000 feet, which however is very unlikely, then the mine-owners will know that the problem before them is either to sink through so much blank country or else to use all their energies in prospecting for payable spurs.

Mr. Veale, the manager, gave me every help and all the information I desired.

[*Report sent in 10.9.06.*]

THE SEDGWICK GOLD MINE, SEDGWICK, NEAR RAVENSWOOD.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The Sedgwick mine is situated about 3 miles easterly from Sedgwick Post-office. The main shaft is on the south side of a gully and 4 chains south of the shaft a saddle reef is exposed in a shallow shaft. The country rocks are seen dipping away to the east on the east side and to the west on the west side of the saddle reef. Below the saddle reef is black shale. Sandstones and slates of grey and brownish colour form the containing rocks. On the north side of the gully centre-country is exposed in an open cutting and below this a quartz reef was worked by means of a tunnel. The quartz was about 3 feet wide and it yielded 4 dwts. of gold per ton. The gold at this mine is worth £3 17s. 3d. per oz. About 27 feet east of the mass of quartz worked by the tunnel along centre-country is a reef that conforms with the containing beds, and dips easterly—a leg reef. The quartz is 15 feet thick, but only traces of gold occur in it.

The whip shaft is 720 feet north of the main shaft and 230 feet deep. An irregular reef 2 feet thick occurs. At 30 feet down, this reef was cut 60 feet east of the shaft; it dips west and cuts the shaft again at 140 feet from the surface. It is reported to be 4 feet thick by the manager, Mr. Ellis, and to contain about 3 dwts. of gold per ton. On the top of the hill, between the whip shaft and the main shaft, a reef, which is 6 feet thick but not auriferous, and which has the same strike as the country, is exposed at the surface.

Only two auriferous gullies have been worked in this neighbourhood; one runs down from the main shaft eastward, and another short gully lies about 1½ miles further south.

About 400 feet north of the whip shaft a little work has been done on a reef at centre-country. It dips west and is apparently a west leg; it has been followed down for 98 feet.

At the surface, the strike of the centre-country or anticline is N. 15 deg. W. In the 300-ft. level there is a cross-cut east for 212 feet. At 48 feet east of shaft there is a level driven south for 293 feet and north for 460 feet. This is along a "back" that has been stoped for 107 feet above the level. The quartz, which formed a leg reef, was about 12 inches thick and was stoped for 100 feet below the north level. At the end of the north level the quartz is 3 inches thick. A cross-cut is driven west from the north end of this level for 200 feet. In the 500-ft. level, centre-country is about 20 feet east of the main shaft. At 70 feet east of the shaft a level is driven north for 180 feet.

At 100 feet in on the east cross-cut a fault is exposed that dips west, and this fault crosses the shaft just above the 600-ft. level. From the cross-cut a level is driven northward on a "back" that dips east. The pitch is northward about 7 deg. About 136 feet north of the cross-cut there is a quartz reef 6 feet thick conforming with the strike and dip of the country. It is said to carry about 3 dwts. of gold per ton.

At the 600-ft. level and 40 feet east of the shaft is centre-country, and a level is driven along it for 193 feet northerly. A quartz reef 2 ft. 6 in. thick has been worked along this level. At the north end only a little quartz is showing, and the reef may be pitching away in that direction. The quartz continues overhead 136 feet up to No. 5 level. One hundred and twenty-six feet east from the shaft is a "back" that strikes with the country and dips east, and a little quartz shows along this.

In this cross-cut centre-country is cut 60 feet west from the level. At 126 feet west of the level is a "back" dipping west and driven on north for 70 feet. There is 6 inches of quartz on this "back." At the end of this level is a rise which communicates with the whip shaft by means of a ladderway of 150 feet in length.

At 230 feet from the surface in the whip shaft and 170 feet north of the shaft, a level is being driven. Centre-country is 20 feet west of the whip shaft. Quartz mixed with mullock occurs in centre-country at the northern end of the workings, but in the level it is not payably auriferous. Overhead 20 feet, the quartz is being stoped and sent to the crushing plant, and the last crushing, 56 loads, gave 22 ozs. 15 dwts. of gold—nearly half an ounce to the ton.

This mine is quite isolated and is several miles away from any other. It lies 3 miles to the east of the richly auriferous Bendigo tract. The nearest productive mines to the east are the Linda and surrounding mines at Lyall, 8 or 9 miles away. The Linda group of reefs occurs very high up in the Ordovician series, probably well up in the Castlemaine zone; in fact they are the highest ridges of the auriferous zone, because there are few places where any alluvial gold deposits occur, and when they do occur they are directly derived from the reefs being worked.

The Sedgwick reefs also are very high up in the series, probably the topmost beds of the Castlemaine zone. Just where the lowest beds are exposed at the surface, that is along the anticline, the reefs carry a little gold.

From the surface of this mine down to the more productive Bendigo zone, there is a great thickness of intervening beds, and the established character of the reefs in the Castlemaine zone is that the gold occurs irregularly; occasionally in rich patches, but on the whole the yields are unsatisfactory and not profitable, at any rate in the higher part of that zone. The average grade in reefs of the Castlemaine zone is low and the only chance of making a margin of profit is by reducing the cost to a minimum. In the case of this mine the only direction in which prospecting operations have any possibility of being useful is downwards on the centre-country, but the depth may be very great.

The manager furnishes the following figures: —

Tons of quartz crushed to date	...	...	8,381
Total gold obtained to date ...		...	3,274 ozs. 1 dwt.
Amount expended ...	...	...	£25,000

[*Report sent in 1.7.07.*]

THE REDESDALE GOLD-FIELD.

By E. J. Dunn, F.G.S., Director, Geological Survey.

Lyall is 6 miles north of Redesdale Railway Station and about 600 feet above sea-level. The country rock is Ordovician and high up in the series, apparently the higher portion of the Castlemaine zone. The rocks consist of very coarse siliceous grits, grey and yellow sandstones, and slate beds; sandstones predominate.

The Horseshoe Bend Reef.

About half-a-mile north of the bridge over Coliban River at Lyall is the Horseshoe Bend reef. The strike of the reef is N. 30 deg. W., dip 67 deg. W. The quartz is 6 inches to 8 inches thick. The country rock on the east side of the reef is coarse, harsh, grey sandstone with numerous quartz spurs. On the west side of the reef the country rock is yellow slate and the soil is yellowish to red. The reef is on a fault line. The country on the east side is the footwall and is barren. On the hanging wall or west side of the fault the country has been thrown up and by this means beds of a productive nature have been brought to the surface and the quartz vein lying between barren country on the east and productive country on the west side is auriferous. The strike of the country rock is N. 40 deg. W. and the dip 62 deg. E., so that the fault does not coincide quite with the strike of the rocks, and in dip it crosses them. The pitch of the country is to the north at 7 deg. at the workings a little to the south of east from the Linda mine.

This line of reefs has been worked at intervals for a distance of nearly 2 miles. It was most actively worked about 40 years ago. Several shafts have been sunk to depths exceeding 100 feet, and a very considerable tonnage of quartz must have been crushed. No great amount of work appears to have been done below water level, and there seems good reason for believing that there is room along this line for further prospecting. The water is not likely to prove very difficult to deal with.

Parallel to the main line of reef, but half a chain away from it on the west side, is a small reef with about the same strike and dip which has been worked in places. The pitch is the same as in the main reef and the shoots of gold follow the pitch of the country in this case also.

About 2 miles east from the Horseshoe Bend reef is Potter's reef, which was worked about the same time as the other reefs in the neighbourhood.

The Linda Reef.

About 12 chains west of Horseshoe Bend reef is the Linda reef. It is about half-a-mile northerly from the bridge over the Coliban River, and it can be traced nearly to the river in a southerly direction. The mine is now being worked and a steam winch is being used for hauling and bailing.

The shaft is 175 feet deep; the strike of the reef N. 15 deg. W., dip 60 deg. W. The pitch of the country is 15 deg. S., and the pitch of the shoot of gold corresponds to this. The shaft is 175 feet deep, and at 60 feet a level has been driven 100 feet northward and 70 feet southward. At 120 feet a level is driven 50 feet northward and 200 feet southward. At 167 feet a level runs 100 feet northward and 240 feet southward. There are three small quartz veins, each from 1 inch to 4 inches thick, one on the footwall, one on the hanging wall, and an intermediate one between the two. The distance between the footwall and hanging wall ranges from about 8 feet to over 20 feet.

Besides the quartz veins, which are rich in gold, the casings are taken for a width of from 6 inches to 18 inches. The footwall and intermediate veins have been stoped from the 167-ft. level to the surface but the hanging wall vein has only been stoped in one part to the 120-ft. level. Owing to the pitch of the country the gold has gone under foot and the south end of this level shows a remarkable mixture of quartz veins and black shaly mineral between sandstone walls on the hanging wall side. At the extreme south end of this level black carbonaceous slaty bands are disclosed which account for the black material associated with the quartz veins.

The present shaft is well situated for prospecting the country, but for following the gold a shaft would be necessary further south. The manager informs me that the gold from this reef is worth about £3 17s. 6d. per oz., and he also states that during the past four years 4,060 tons of quartz have been crushed for 1,349 ozs. 10 dwts. 14 grs. of gold.

Bill Smith's Workings, etc.

Southward from the Linda mine and on the north bank of the 'Coliban River, and 25 chains west from the bridge, some parallel quartz veins were worked, but only to shallow depths.

A few chains still further westward, is another reef that has been more extensively worked. The strike of the reef is N. 20 deg. E., dip 55 deg. W. The quartz is about 1 foot thick. A tunnel was run from a gully for two or three hundred feet. The country rock is coarse yellow and grey sandstone. Five chains west of this reef there is a remarkable outcrop of quartz that does not appear to have received much prospecting. The country rock is a coarse grit.

The Ben Guy Reef.

About 20 chains west from the Linda reef and near Myrtle Creek is the Ben Guy reef at present being worked by a co-operative party. This reef has recently been opened up and is the northern continuation of the old Amelia reef which was extensively worked in the early days and is reported to have yielded richly.

The strike of the Ben Guy reef is N. 15 deg. W., dip 66 deg. W., pitch N. 23 deg. The country rock is yellow sandstone. North of the gully there are three or four quartz veins, each from $\frac{1}{2}$ inch to 2 inches thick, in a width of 3 feet. The stone pays well for working as the quartz veins are rich in gold and yield up to 2 ozs. per ton. The pitch is northward at about 40 deg. This line of reef has been traced through a claim further northward and on to the top of the spur where it enters private property. From the east side of this spur a little alluvial gold has been traced towards the Linda mine. It is the only alluvial gold found in any of the gullies in this neighbourhood.

Just south of the gully where the Ben Guy workings are, a dyke of much decomposed rock (diorite ?) occurs. The strike of the dyke is W. 40 deg. N., dip W. The dyke appears to have been displaced by the fault in which the Ben Guy reef has formed, for it is traceable up to the reef but not to the east of it. The dyke has been traced for $2\frac{1}{2}$ chains to the west of the reef, and on the north side of the gully where it has been stripped to a couple of feet in depth from the surface. On the west side, between the dyke and the hanging wall of slate to the west, there is a small quartz vein from 1 inch to 2 inches thick which shows gold freely. Where the dyke abuts on the quartz vein it is 4 feet thick, and there is a thin reef of rich quartz on each wall. On the north side of the gully the dyke has widened out considerably, but the total width has not been determined. Probably on the east wall there may also be a quartz vein carrying gold. The auriferous quartz associated with the dyke was first discovered in a rabbit burrow.

The Amelia Reef.

About half-a-mile southward from the Ben Guy reef and on the east bank of Myrtle Creek is the Amelia reef worked about 40 years ago, and it is reported, with good results. The strike of the reef is N. 5 deg. W., dip

30 deg. W. at the surface and about 60 deg. W. lower down; pitch N. at 20 deg. The quartz vein was only a few inches thick but about 2 feet of the quartz and casing on the footwall was crushed. The hanging wall is coarse sandstone, and the footwall hard grey sandstone. The soil is reddish in colour. Extensive mining operations have been carried on at this site, but there is no evidence of much work below water-level, and as the shoot to that level was evidently well worth working there should be some root to it that would be worth searching for. The Amelia reef and the Ben Guy reef appear to belong to the one line but faulting has broken their continuity.

Five chains east of the Amelia reef and on the top of the hill is the Jumping Moses reef. The strike is N. 15 deg. W., dip 65 deg. W., pitch of the gold shoot, N. Country rock yellow and grey sandstone. The soil is red. Shafts have been sunk to a depth of over 100 feet and considerable work has been done.

The United Brothers' reef is about half-a-mile west of the Amelia reef. Still further west, about 1 mile, is the Faugh-a-ballagh reef, and about half-a-mile further west is the St. Kilda reef.

The features of this district are Ordovician sandstones and slates, yellow in colour where altered by atmospheric action, and apparently belonging to a zone higher than the productive portion of the Castlemaine zone. Lines of fault, more or less north and south in direction, have cut through the strata, not along the strike of the rocks, but at a small angle to it. These faults dip to the west or towards the granite mass of the Mount Alexander range. The angle of the dip is from 60 deg. to 70 deg. The west side of the faults is the upthrow side, and as a result a lower series of beds which belong to an auriferous horizon are brought to the present surface. The beds on the east side of the fault represent a barren zone. The quartz reefs in some cases are between a barren wall on the east and a productive set of beds on the west. At lower levels the reefs will have productive walls on both sides, but there is no means of determining the extent of the movement in the faults at present. In every case noticed in this area the pitch of the country and the pitch of the gold shoots correspond.

It is highly probable that the faulting of the strata is directly connected with the intrusion of the granite further west.

This district certainly is a neglected one for it is evident that reefs which were profitable to work 40 years ago should pay handsomely now. In most cases work ceased at the water line and the gold below that line remains to be won. Water level here is 60 feet to 70 feet from the surface.

Small co-operative parties with steam winches should find profitable employment in following the gold shoots below water-level. The water in this area is not heavy to deal with.

Mr. Taylor, manager of the Linda mine, furnished much information concerning the local reefs.

Basalt (bluestone) free from surface cracks, vesicles, veinings and pipes is greatly in demand by stonemasons, and the flows that are even in texture and suitable for monumental and other fine work are scarce. At Redesdale Junction Railway Station there is a flow of basalt that appears to be well worth investigating for fine textured building stone.

[*Report sent in 21.9.06.*]

NOTES ON QUARTZ REEFS, LIGNITE, CLAY, AND BASALT, NEAR KILMORE.

By E. J. Dunn, F.G.S., Director, Geological Survey.

Leyden's Paddock Reef.

Leyden's Paddock reef is situate about 1½ miles in a southerly direction from Bylands Post-office, and is 1,600 feet above sea-level. The country rocks are grey and yellow slates and sandstones of Upper Silurian age. The soil is grey.

The reef is situate near the top of the Divide. The strike is north and south, dip 85 deg. W. It appears to be on an anticline, as the country dips west on the west side and east on the east side of the reef. The quartz is cherty and close-grained in character, and has a ferruginous stain. The pitch of the country is N. at 15 deg. Dip 20 deg. W. on one side of the reef and about the same angle east on the other side. The quartz varies in thickness from 3 inches to 2 feet, and it is said to carry gold to the extent of a few dwts. and a few loads are broken at the surface for a trial crushing. Depth of shaft 20 feet. The reef has been driven on northward 20 feet and southward 5 feet from the shaft. A Kilmore syndicate is prospecting this reef.

Goldie, near Kilmore.

Since my previous report a shaft has been sunk 120 feet to prospect for a western leg corresponding to the eastern leg which has been extensively worked and also for any other developments of auriferous quartz. The shaft is sunk through grey sandstones and slates of Upper Silurian age, but there are no fossils available to indicate the zone to which these beds belong. From the shaft a cross-cut has been driven east for 43 feet. At the bottom of the shaft the beds dip east for 3 feet, then west for 27 feet to the anticline or centre country. From centre country to the east face is 13 feet and the dip is about vertical. The pitch of the anticline is about 20 deg. N. The trend of centre country is westward as in the bottom of the shaft it is about 10 feet further west than at the surface. A fault dipping 15 deg. W. cuts through the beds east of the shaft. There is a little quartz in the fault.

The work so far done is of a negative character, but it has tested country below that in which the auriferous quartz was formerly worked. The shaft should be deepened to still further prospect this site; this would entail the erection of a small winch, as the water level has been reached.

It also seems desirable that the east leg formerly worked should be prospected further north than the present end of the workings and below water level, as the shoot of gold formerly worked pitches north. There is a shaft 170 feet deep at this end and if it were unwatered, work might be done from it.

Quartz and Other Rocks in Basalt, Kilmore.

In the road cuttings near the gaol at Kilmore blocks of quartz and sandstone and smaller pieces that may be pebbles of quartz, granite, sandstone, &c., are abundantly disseminated through the basalt, which is somewhat vesicular as a rule. These blocks range downwards from over 18 inches in length. The quartz and other foreign rocks are much fractured and altered, evidently by the heat of the molten basalt.

Quartz pebbles and fragments are occasionally observed entangled in the basalt flows, but the Kilmore occurrence is unusual on account of the size and abundance of foreign rocks.

Lignite near Kilmore.

Tertiary clays are exposed on Mrs. J. T. Allen's farm, on McIvor-road, $3\frac{1}{2}$ miles from Kilmore, in a gully that runs into Kilmore Creek from the south. This place is about 1,300 feet above sea-level. The lowest observable beds consist of black shales, with impressions of small plants; these shales strongly resemble the plant bearing shales at The Basin, Daylesford, and are probably of the same age (Miocene). In these shales branches of trees and fragments of wood altered to black coaly material with bright lustre are found, but they do not occur as a distinct layer. There is not much of the lignite to be seen and only by boring could it be determined what is the thickness of the shales, and whether there are any thicker deposits of lignite. There is nothing to warrant any outlay in further prospecting the locality.

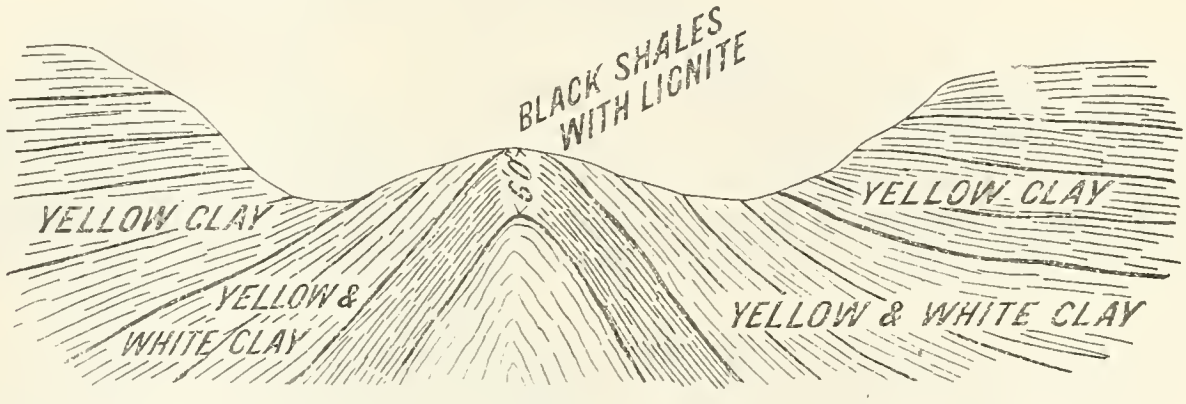


Fig. 5.

Section across Lignite bearing Shales, Kilmore.

Just above the black shales are beds of yellow and white clay of favourable appearance and considerable thickness. Resting on top of these clays is a layer many feet thick of siliceous cherty rock, in which fragments and pebbles of quartz are embedded.

The following report has been made by Mr. P. G. W. Bayly after testing the clay at the Laboratory :—

> "The material as received has evidently been puddled, and appears to consist of white washed clay. It is free from grit. It is a good plastic clay, which makes up into firm briquettes. At a muffle temperature a cane-yellow brick is produced; at a higher firing it changes to a grey slate colour with slight swelling, but only incipient vitrification :—

Test.	Conditions.	Shrinkage.	Appearance.
0	Air dried	4.5 per cent. ...	Dull white, firm.
1	Muffle, 1100° C. ...	11·0 per cent. ...	Yellow.
2	Twice fired, 1450° C.	Slightly swelled ...	Greyish.
3	Furnace, 1450°C. ...	Slightly swelled ...	Greyish, overburned.

> "This clay should be of economic value for many varieties of pottery ware now being manufactured in Victoria."

In the bottom of the gully in consequence of the removal of the overlying material and through the pressure of the material on both sides of the gully by the clay beds and the soil resting on them, the black shales have been bent up and brought to the surface. Extending back from the gully, especially on the east side, is a series of cracks and subsidences caused by the clay below becoming saturated with water and being squeezed out at the bottom of the gully.

The manner in which these Miocene beds are tilted at this locality explains the manner in which the beds of apparently the same age have been tilted at The Basin, Daylesford. On Mrs. Allen's farm there appears to be a considerable area of similar deposits. The soil furnished by these beds is very poor and there is much pisolitic iron ore in it.

[*Report sent in 3.9.07.*]

NOTES ON A SKETCH SURVEY OF THE CALEDONIA REEFS AT WARRANDYTE.

By A. M. Howitt.

The following is a report on a geological sketch survey of a small area around allotments 3, 3B, &c., near "The Island," parish of Warrandyte, made for the purpose of showing the position of the Caledonian group of reefs relative to those on the north in the Nillumbik survey, and to those on the south in Quarter Sheet 40 N.W. (Ringwood-Warrandyte survey).

The rocks are Cainozoic and Silurian. The Cainozoic formation consists of sands, clays, and gravels, and in some places auriferous wash, occurring in the small gullies and along the creeks and river flats. The Silurian rocks are shales, slates, sandstones, quartzites, and coarse and fine conglomerates. In the coarse sandstones and fine conglomerates fossil remains occur, chiefly encrinite ossicles and stems. One locality south of the Caledonia Consols shows an abundance of fossil remains (see x on plan). The Silurian beds are much folded, and several anticlinals and synclinals were observed and marked on the plan. The pitch, where noted at the surface, was to the north. A complete anticlinal fold can be seen south of the Reward mine.

Reefs.

The Caledonia Reef.—The strike is N. 32 deg. E. and dip 85 deg. W. In examining the rocks in the main mullock heap I found blocks of a basic dyke, which the manager informed me came from what is known in the mine as the "cross-course" in the south workings. A full report of this mine has been made by Mr. E. J. Dunn, F.G.S., Director of the Geological Survey of Victoria.

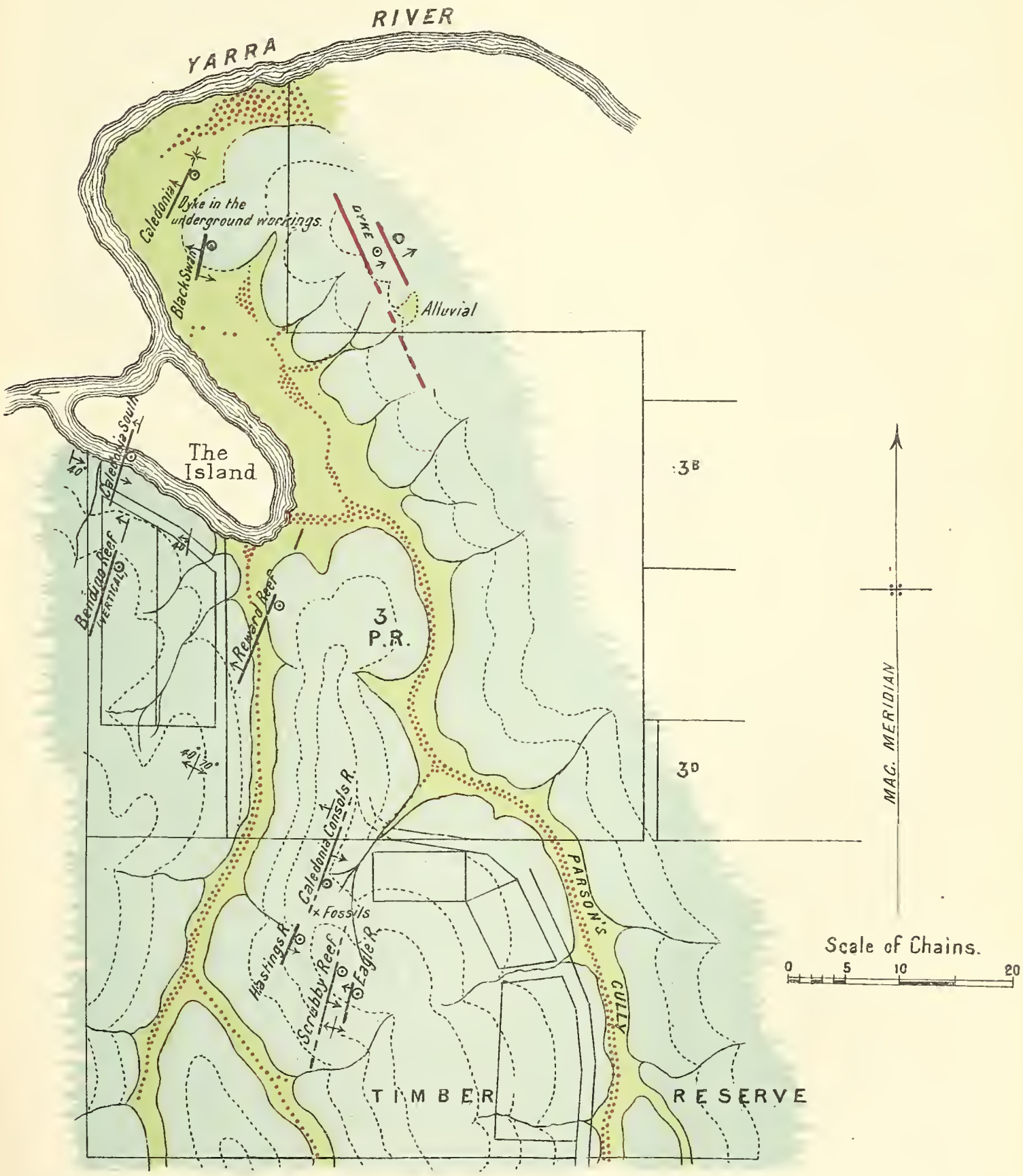
The Caledonia South Reef.—This is seen on the Ringwood-Warrandyte road and at "The Island." The strike of the reef is N. 20 deg. E., dip 85 deg. E.; dip of beds 45 deg. W., so that the reef cuts the beds at a wide angle. A synclinal fold occurs to the west of this line of reef.

The *Caledonia Reward Reef* is situated south of "The Island" bend of the Yarra at Captain Selby's. The strike of the reef is N. 20 deg. E., dip 83 deg. W. The country dips to the east, so here also the reef cuts across the strata. It is close to an anticlinal fold which can be seen plainly to the south. The reef is reported as averaging 5 inches wide and yielding as much as 4 ozs. per ton where crossing Selby's Creek on the north.

The Caledonia Consols Reef (formerly called the Pigtail Reef).—The strike of the reef is N. 23 deg. E., dip 83 deg. E. This reef is situated about $\frac{1}{4}$ mile south-east of the Reward mine. The strata dip to the west. The company has been working lately on an 8-inch reef at the 170-ft. level. This reef is also close to an anticlinal fold (see plan).

GEOLOGICAL PLAN

PORTION OF THE PARISH OF WARRANDYTE SHOWING THE REEFS OF THE CALEDONIAN GROUP



REFERENCE.

Alluvium. Silurian (Mudstones, slates, shales & conglomerate.)

Reefs, Dykes, Dips, Anticlinal Folds, Synclinal Folds, × Fossils.

Alluvial workings.

Other reefs marked on the plan are the Hastings, the Scrubby, and the Eagle, situated to the south of the Caledonia Consols, the Black Swan to the south-east of the Caledonia mine, and the Bendigo, a little to the south-east of the Caledonia South. Dyke workings are seen on the hill-top directly to the east of the Caledonia. For yields, workings, &c., see reports mentioned below.

Felspar associated with the quartz reefs was noted at several of the mines, probably indicating the presence of small dykes other than the main north-west and south-east line, and adjacent to each reef. The Caledonia case is one example.

The reports mentioned below on this area and its reefs, leave but little for me to add:—

E. J. Dunn, F.G.S., Caledonia mine, Warrandyte. Rec. Geol. Survey, Vict., Vol. II., pt. 1, pp. 50-51, 1907.

R. A. F. Murray, F.G.S., Report on the Warrandyte Gold-field. Special Report, Department of Mines, Victoria, 1896.

W. Forbes, Report on the geological survey of Warrandyte. Progress Report, Geological Survey, Victoria, No. IX., pp. 47-48, map and sections, 1898.

Other plans to the north and south of this area are:—Geological plan of Nillumbik by O. A. L. Whitelaw. Geological Quarter-Sheet 40 N.W., Warrandyte-Ringwood, by R. A. Moon, B.E.

[*Report sent in 24.4.07.*]

THE GENERAL FEATURES OF THE JAMIESON GOLD-FIELD AND SOME MINES BETWEEN JAMIESON AND WOOD'S POINT.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The Jamieson Gold-field.

The country rock that prevails in the Jamieson district is Upper Silurian in age and at least portion of it appears to belong to the upper zones, such as those found at Walhalla, but not the very highest, which usually consist of mudstones and limestones. No sign of these was noticed.

The usual rocks are slates, sandstones, and silty beds, and they must represent a very great thickness, taking into account the mountainous nature of the country and the manner in which these corrugated beds have been carved out to form the present valleys.

In this great thickness of sandstones and slates certain zones are productive of gold where the other conditions are favorable. Other zones are barren whatever the other conditions may be, and the recognition of these barren and productive zones is of primary importance. They should be mapped out, and in this way a considerable service would be rendered to mining, for in actual experience it is found that if all the other conditions are favorable in the productive beds, then gold is obtained, but if all the other conditions are favorable in a barren zone there is no gold present.

Dioritic dykes are a prominent feature in connexion with the gold mines of this district. At Raspberry Creek the A1 mine is in an enlargement of one of these dykes. Many of the other mines are dependent on the contact of the dykes with the reefs for the gold they furnish. Even where the dykes occur, unless all the other conditions exist, little or no gold is found. If there are reefs in the productive zone, but no dykes, there is no gold in certain cases. If the dykes cut through productive country,

but there are no reefs, then there is no gold; but if the dykes cut through productive beds and reefs intersect the dykes, then gold occurs along the intersections of the reefs and the dyke. If the dyke is faulted, then along both contacts of the faulted dyke with the reef gold occurs. (See Fig. 7).

On the other hand, if dykes occur in the barren zones of country and they are intersected by reefs there is no gold, and it is probably owing to this distinction between the productive and barren zones of country rock being overlooked that the dykes are locally looked upon as unreliable guides to the golden quartz.

Some extremely interesting features in connexion with the dyke occurrences are met with in the New Home Rule mine, near Knockwood, and New Alabama, near Ten-mile, &c. Dykes are associated with many of the Jamieson mines, and where they have not been observed it does not follow that they do not exist. They may have been missed in the working, but still have influenced the gold occurrences. Their direct relation to the occurrence of gold in many of the mines is very obvious.

Another very important feature on this gold-field which requires to be fully grasped in carrying out mining operations is that the country rocks are bent into a series of anticlinal and synclinal folds. Along these anticlines saddle reefs are met with, and they have been worked at such mines as United Gleeson's, the Star of the West, near Ten-mile, the Blue Ribbon, &c. The most extensive workings on saddle reefs have been at the United Gleeson's mine, and at this locality a great deal remains to be done in exploring for other reefs below those already worked which have produced a great quantity of gold.

Up to the present systematic search for other saddle reefs does not appear to have been undertaken. The same methods as are employed at Bendigo for exploiting the country for saddle reefs are applicable to this field. The saddle reefs in Gleeson's leases are of large size, and the "legs" of quartz are many feet in thickness.

The two diagrams below indicate the structural features of the field. Fig. 6 shows the folded Upper Silurian slates and sandstones before the faulting, intrusion of dykes, and formation of quartz reefs along the faults.

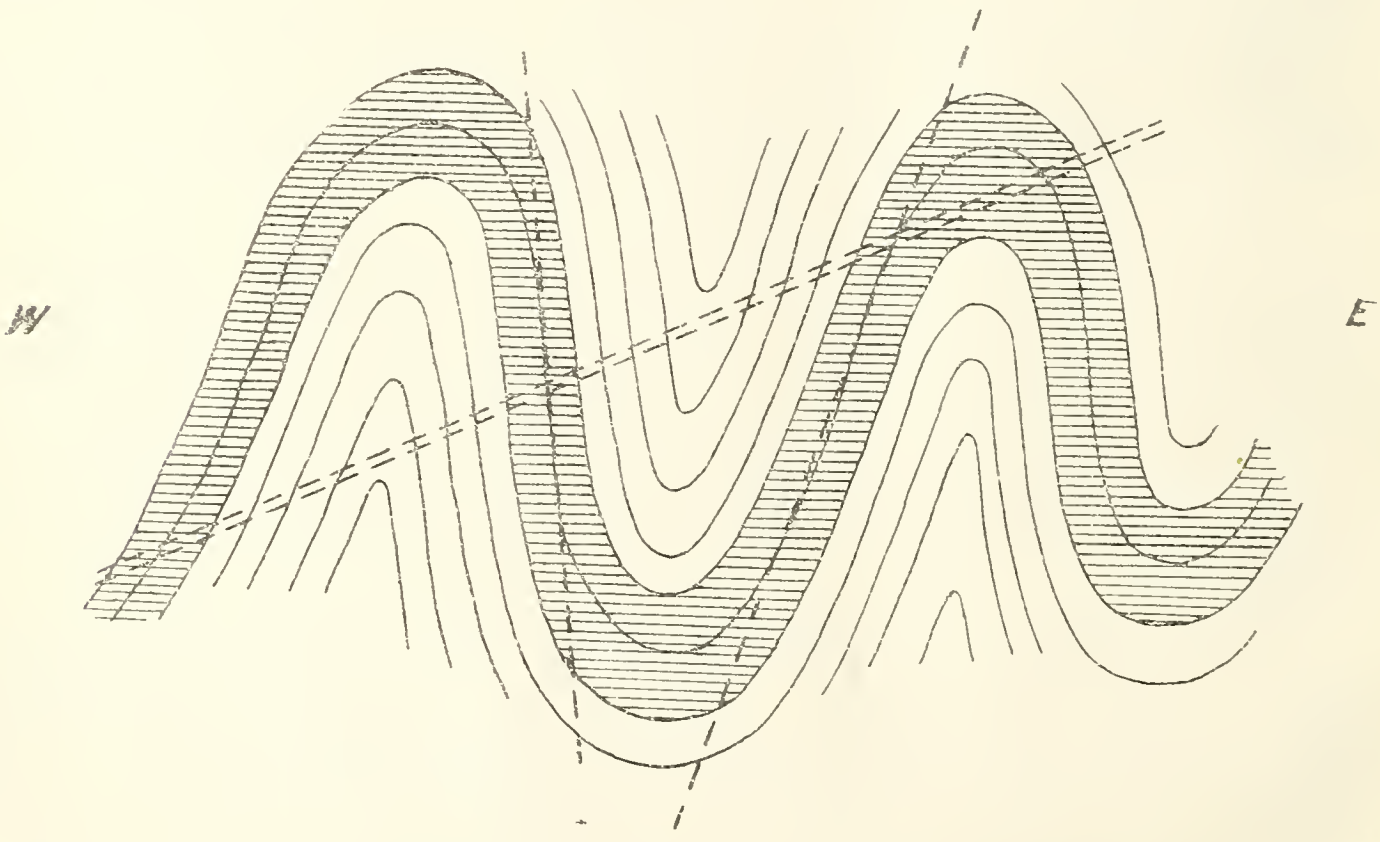


Fig. 6.

The next figure illustrates the present structure and the conditions under which the gold occurs. The Upper Silurian slate and sandstone

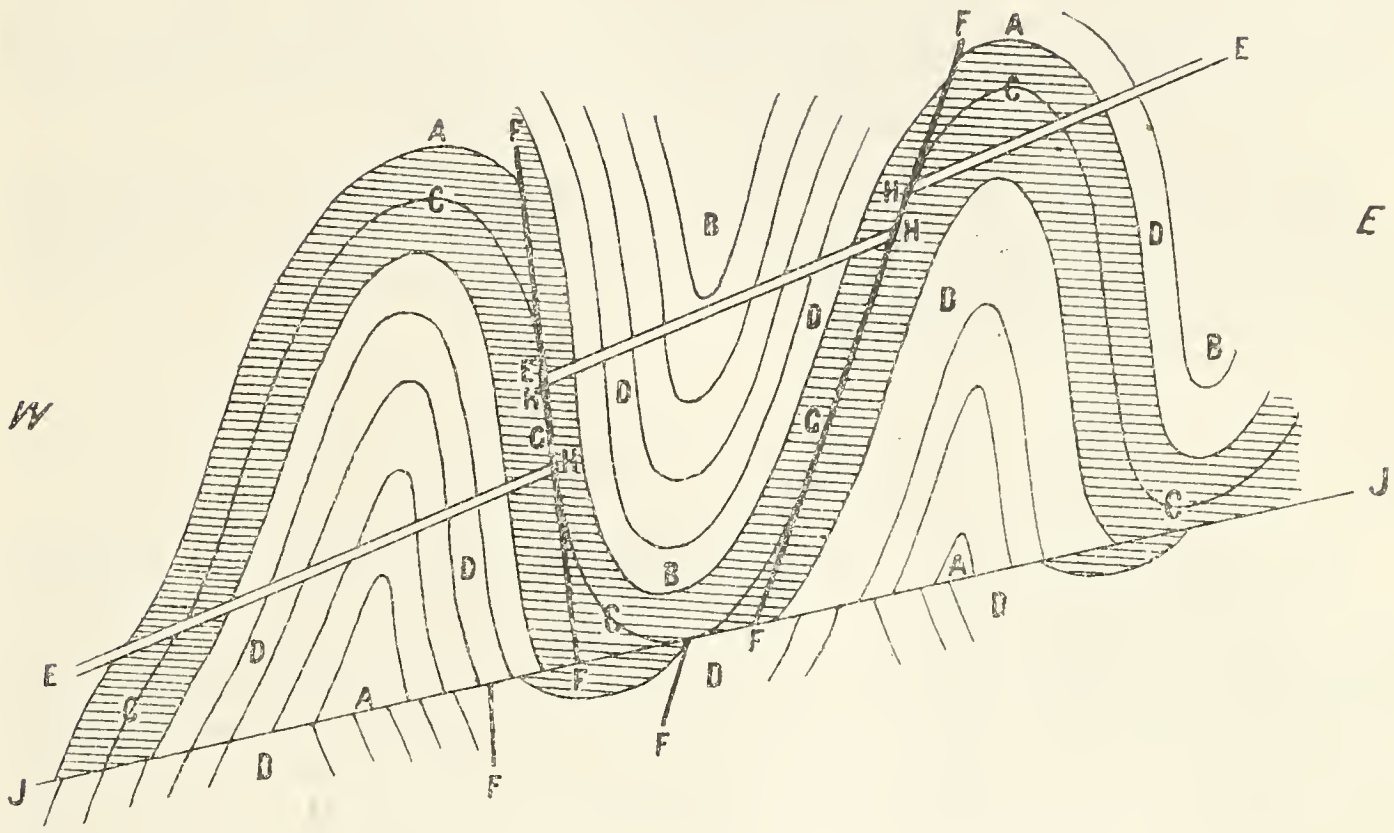


FIG. 7.

beds are folded into a series of anticlinals (A) and synclinals (B). Certain zones (C) in these beds are productive of gold, others, (D), are barren. A dioritic dyke (E) cuts through all the beds both barren and productive. Subsequent faults (F) have cut through the dyke and are now occupied by quartz reefs (G). Where these reefs are in a productive zone and in contact with the dykes (H) they are auriferous. After the formation of the reefs flat faults (J) have displaced them.

On this gold-field the tunnel phase of mining still holds, and only in one or two instances have shafts been sunk to lower levels, so that experience has not proved what the gold-field is likely to be in depth. So far as sinking has proceeded the results are favorable, and there does not appear to be any valid reason why the mines should not be productive as depth is attained. There is the one encouraging example of Walhalla, where the conditions are very similar and rich yields of gold are obtained from depths of 3,500 feet and more. The Jamieson gold-field deserves to be thoroughly opened up in depth, and it should become a large contributor towards the gold yield of the State. A geological survey of the surface and proper under-ground surveys of the mine would greatly assist its development.

THE CHAMPION MINE, TEN-MILE.

The tunnel at the Champion mine runs in from the east side of the hill in a direction W. 5 deg. S. The rock consists of Silurian slate and sandstone dipping west at the tunnel mouth. Three hundred feet in, the Champion reef was cut. The reef is a "leg" conforming in strike and dip with the country. It is from 3 to 12 inches thick, and the quartz carried 6 ozs. of gold per ton at the surface. The dip of the reef is 52 deg. W., strike N. 10 deg. W., pitch N. at 30 deg. It has been stoped along

levels for 300 feet north of the tunnel and 300 feet south of the tunnel on one continuous shoot. Along the whole length the reef has been stoped from the tunnel level to the surface 90 feet above the tunnel. The shoot pitches northwards. At 150 feet west of the Champion reef the tunnel cuts another reef. In the north level, driven on it 60 feet from the tunnel, there are irregular spurs crossing the country rock; 500 tons crushed from these spurs yielded 1 oz. of gold per ton of quartz.

At 250 feet below this, a tunnel is being driven to intersect the shoot further north. It is now 800 feet long and will be 1,000 feet long when completed. The Champion mine is about 20 chains S. 20 deg. E. from the New Alabama tunnel.

The United Gleeson's Mine, Ten-Mile.

The United Gleeson's lease includes the old Sailor Bill's mine and several other original small holdings. These properties are noted for the rich yields formerly obtained. At present very little work is being done, although the conditions are such as warrant energetic development. An immense amount of work has been done, and there are numerous tunnels, shafts, &c. No. 5 tunnel is about 2,100 feet above sea-level. It is driven on a reef-track, and conforms to the strike of the country, which consists of slate and sandstone of Silurian age. The reef, which dips west, is known as the Easter Leader, and the quartz is about 12 inches thick. The quartz has been stoped from the tunnel to the surface, and below the tunnel for another 30 feet. The top of the hill to the westward is 600 feet above the level of the No. 5 tunnel, and the works are connected right through.

About 900 feet in from the tunnel mouth the level branches. The right hand branch continues for 300 feet and the left branch for 600 feet beyond the junction. Near the junction on the west branch is the Main reef, which expands to 10 or 20 feet in width, and consists of country rock through which quartz spurs ramify. The country here dips 85 deg. E. and pitches N. at 25 deg. About 300 feet in on the west branch of the level the quartz has been removed to a width of 16 to 18 feet. There is an abundant efflorescence on this quartz of what appears to be sulphate of magnesia. At this point a winze has been sunk 90 feet. Further in there are a saddle reef and a leg of quartz belonging to another saddle reef, the quartz being 6 feet thick. Nearer the mouth of the level and to the west of it a great mass of very rich gold-bearing quartz was removed when the mine was first worked, and the cavity is known as the "Ball Room." There is ample evidence in this mine of centre country with saddle reefs and legs, but the structure does not appear to have been grasped. There remains a great deal of exploratory work still to be done. Special attention should be directed to sinking in centre country and to cross-cutting, so as to discover other saddle reefs and "legs." A shaft is essential for the further development of the mine, and it is to be expected that if the centre country is further explored in depth new saddle reefs will be discovered.

The Blue Ribbon Mine, Ten-Mile.

The Blue Ribbon mine is situate at about $2\frac{1}{2}$ miles in a southerly direction from Ten-mile township on Purdy's Creek, the left-hand branch of Sailor Bill's Creek.

No. 1 tunnel is on the hillside about 1,900 feet above sea-level and is driven 350 feet in a direction W. 20 deg. N. At the tunnel mouth the Silurian slates and sandstones strike N. 10 deg. W. and dip to the east at 70 deg. A few feet in, the country rocks dip to the west at 85 deg., and at 60 feet from the mouth the beds dip west, and a reef conforming to them and 4 inches thick was cut. The strike of the reef is W. 20 deg. N. At 280 feet in, a reef 2 inches thick and nearly sertical was cut. A dyke intersects this reef but only a little gold occurs in the quartz. A level is driven north 12 feet on the reef; it then follows the dyke, which is $2\frac{1}{2}$ feet thick and strikes N. 37 deg. W. Along the dyke, 25 feet from the tunnel, is a "leg," and this bends over and forms a saddle reef.

At 300 feet from the mouth of the tunnel is another quartz reef $2\frac{1}{2}$ feet thick, which bends over the anticline. This saddle reef has been worked profitably on both legs and over the arch. At 150 feet northerly from the tunnel a saddle reef has been stoped. There are three saddle reefs in this part of the mine, one over the other, all of which have been more or less worked and with good results.

The south tunnel is in a gully, and considerably lower down than No. 1 tunnel. It is being driven in a westerly direction, and has cut the saddle reefs on the southerly pitch. In working this mine the structure of the country with its saddle reefs has to be carefully considered, and the prospecting work has to be done in the best direction for intersecting fresh saddle reefs and legs.

There are two anticlines cut by No. 1 tunnel, one near the mouth of the level and the other about 300 feet in. The best site for prospecting for other saddle reefs is down through centre country. The gold as in most of the neighbouring mines is worth £3 17s. 6d. per oz.

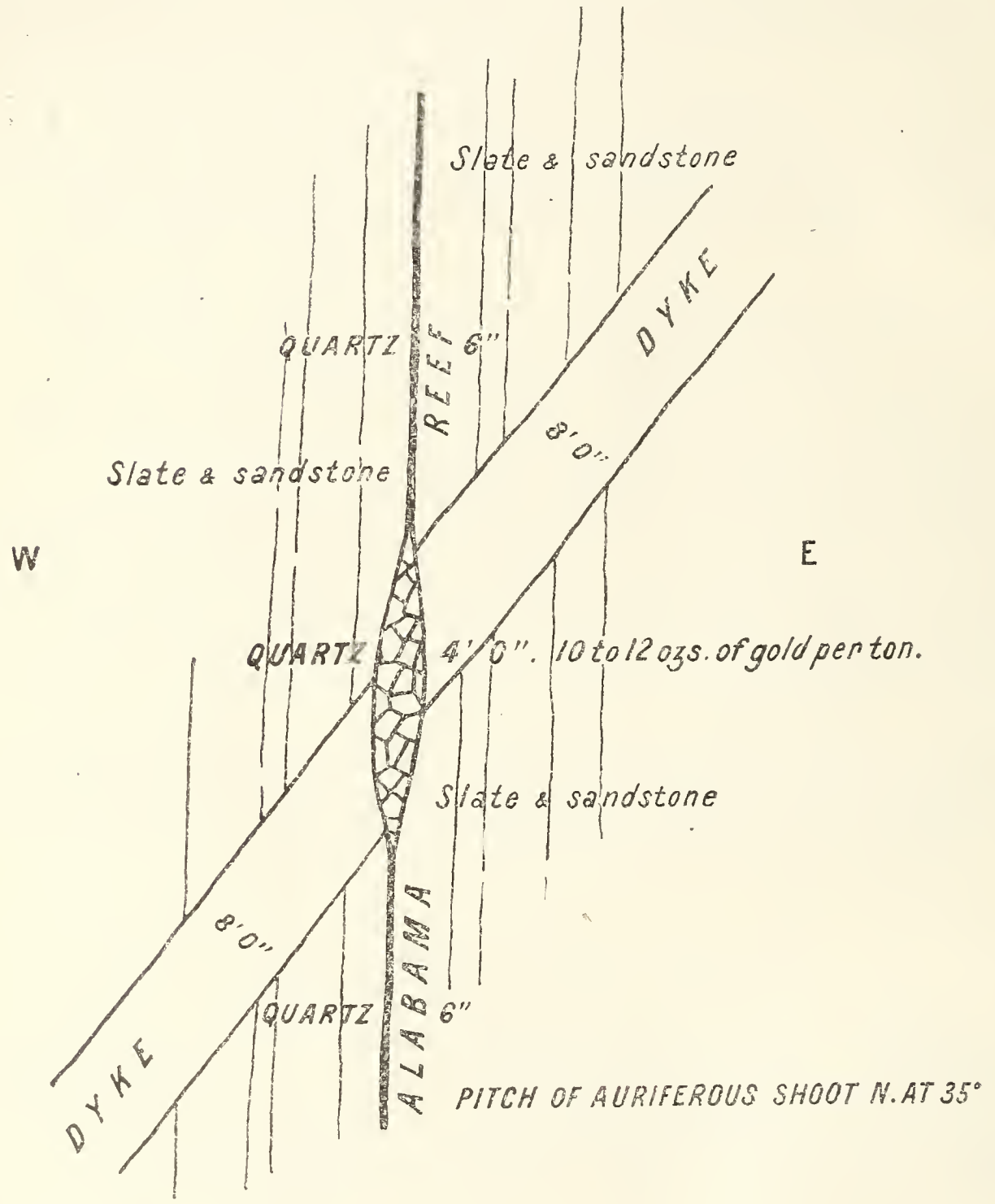
The New Alabama Mine, Ten-Mile.

Sailor Bill's Creek, which has been worked for alluvial gold right up to its source, runs into the Ten-mile from the south. One mile up this creek is a dyke which has been traced for a considerable distance across the country. The belt of auriferous country commences about 1 mile west of Ten-mile and is about 2 miles wide to the west of this point.

At the New Alabama mine, which is about $2\frac{1}{2}$ miles westerly from Ten-mile township, a shaft has been sunk 260 feet. A dyke dips west from the surface and is cut in the shaft at 210 feet. It is from 1 to 6 feet thick. Where the quartz veins intersect the dyke they are auriferous.

A flat fault throws the reef above it 100 feet to the east of its continuation below the fault. On the east side of the hill is a tunnel at the mouth of which the Silurian slate and sandstone beds strike N. 25 deg. W. and dip 70 deg. W. The tunnel is 140 feet below the sill of the shaft and is driven in a direction S. 35 deg. W. At 300 feet in from the mouth of the tunnel the Alabama reef was cut and a level driven northward for 400 feet to the shaft on the hill. The shaft has been sunk 120 feet below this level. A dyke dipping 50 deg. W. is intersected in the level by the Alabama reef 50 feet south of the shaft. At the intersection the quartz expands, and this expansion is vertically about 12 feet in height and about 1 to 4 feet thick, the general thickness of the quartz leg on the Alabama reef being about 3 to 6 inches thick. Where the expansion occurs there was stone that yielded several ounces of gold per ton. The

intersection of the dyke by the quartz veins pitches northward, and the shaft was sunk to work this northern portion. Where the shaft cut the intersection, the quartz yielded about 1 oz. of gold per ton of quartz.



Scale, 20 feet to 1 inch.

FIG. 8.

Alabama Dyke: Vertical Section 50 feet south of the Shaft.

A flattish fault, which dips northward and is of the same class as the fault in the Star of the West mine, was met with about 70 feet above the tunnel level.

Thirty-seven feet west from the Alabama reef is Polar's Leader. This reef is about parallel to the Alabama reef, and it has been worked by levels for 100 feet northward and for 100 feet southward of the tunnel, and stoped right to the surface (140 feet) as well as for 25 feet below the tunnel level. The pitch of the shoot is N. 20 deg. The lode cuts a dyke at the level. The quartz of this leader averaged about 1 ft. 8 in. thick. Further west 120 feet along the tunnel is Hughes's reef, which runs from 6 to 12 inches thick. It has been worked for 100 feet north of the tunnel

and has been stoped right to the surface and also 30 feet below the level. This reef conforms to the country rocks and is a "leg" striking N. 25 deg. W. and dipping 85 deg. W. The shoot in Polar's Leader is northerly, and the shaft is being sunk to cut the shoot on its pitch.

The Birthday mine is being worked about 10 chains south of the Alabama tunnel. It was not examined, but the proprietor informed me that there are some interesting examples of faulting in it.

The Star of the West Mine, Kevington.

The Star of the West mine is on Mack's Creek, 7 miles from Jamieson, on the Wood's Point road. The creek was first worked for alluvial gold and later on the gold was traced right up to the reef. The country rocks (slate and sandstone) are corrugated Silurian beds that strike N. 30 deg. W. and dip 85 deg. S.W. near the site of the battery, but in the tunnels the rocks dip east in some parts of the mine, though the dip is generally to the west. An anticline with saddle reefs shows in No. 1 tunnel and also in No. 2 tunnel.

At the south end of No. 1 tunnel there is a distinct saddle reef which has been extensively worked right over the anticline. The apex of the saddle reef was about 20 feet above the tunnel level. From this level the eastern leg has been stoped down to No. 2 tunnel or about 120 feet. There appears to have been an overthrust, for as the east leg at No. 1 level is followed down, it gradually turns until in No. 2 tunnel it is a west leg, and it continues dipping west right down to No. 3 tunnel.

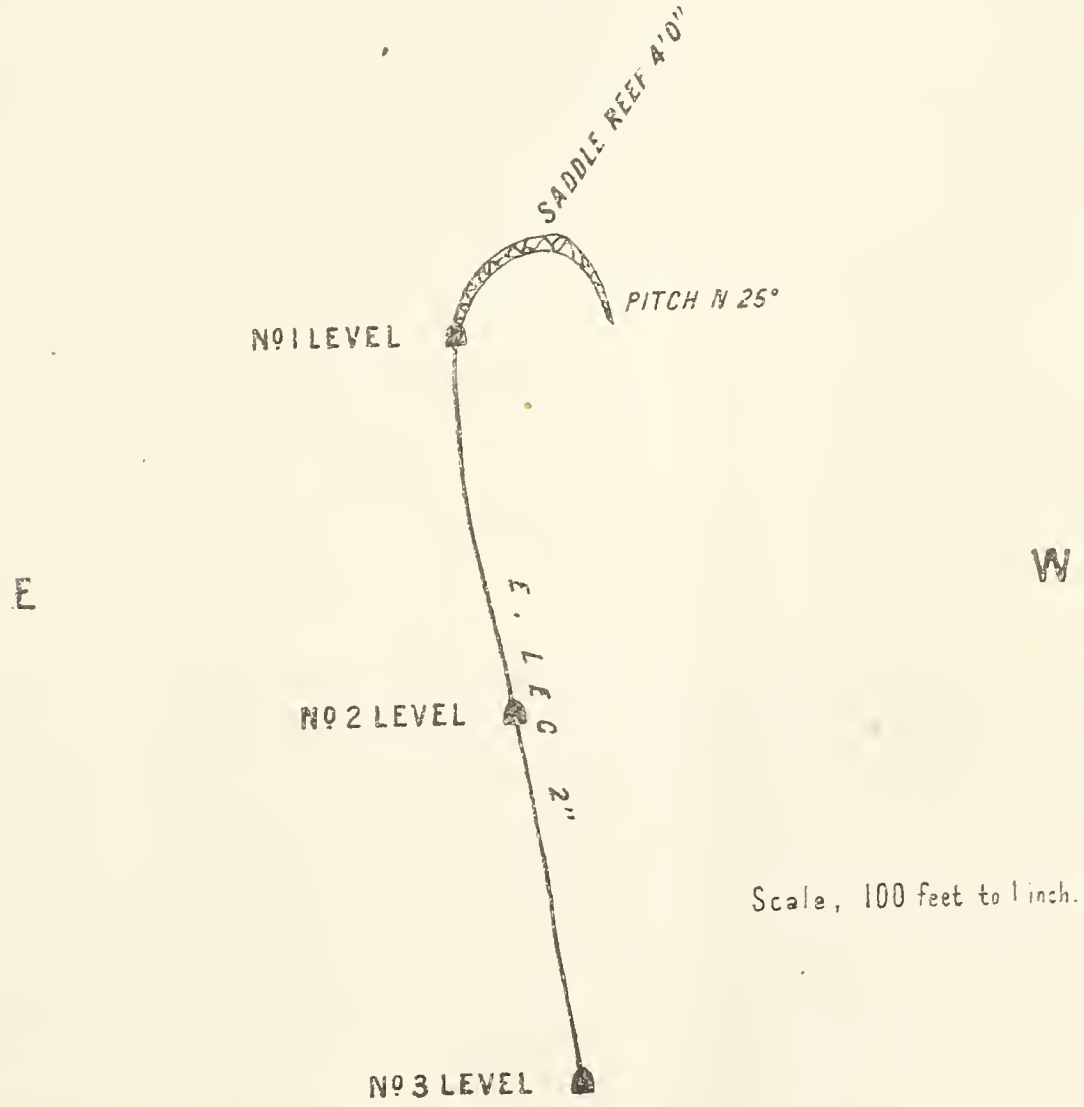
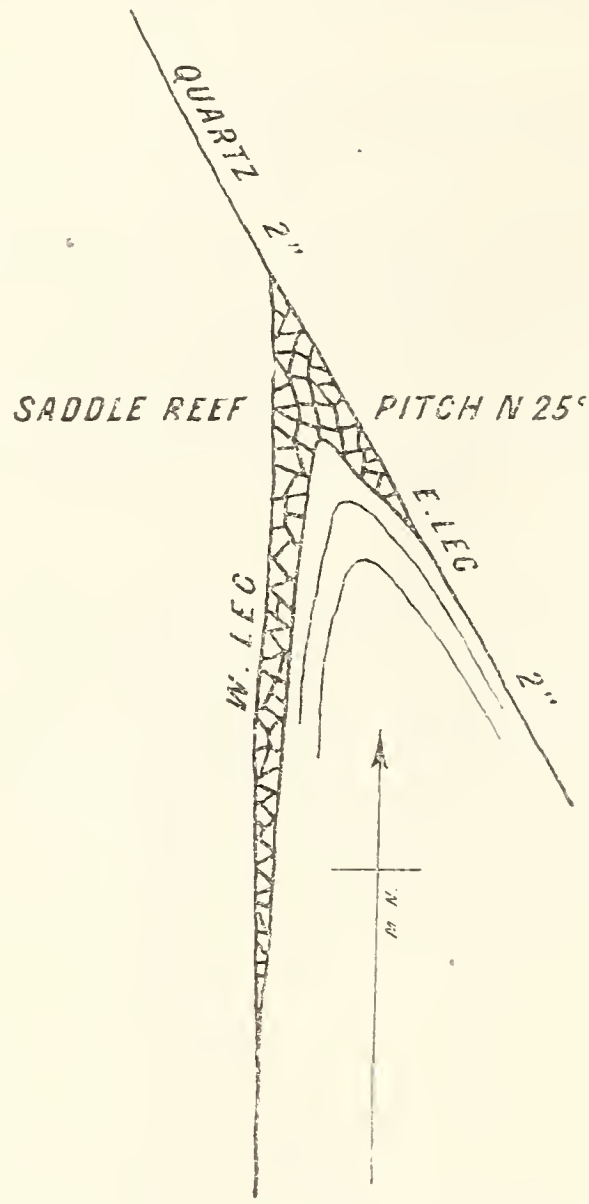


Fig. 9.

Vertical section through the Saddle Reef, Star of the West Mine.

In No. 2 tunnel the dip of the country at the mouth is 85 deg. W. There is a crosscut of 29 feet to the reef, which conforms to the country rock in dip and strike. The quartz followed in is about 2 inches thick. At about 229 feet from the mouth is a winze connecting No. 1 with No. 3 tunnel, a depth of 115 feet. At 280 feet from the mouth, the top of the saddle reef was touched and the reef with east and west legs was worked.



Scale, 40 feet to inch.

FIG. 10.

Plan of the Saddle Reef in the No. 2 Level, Star of the West Mine.

On the east wall the leg was worked for 35 feet along the level. The west leg was worked for 90 feet along the west branch of the tunnel. The pitch of the saddle reef is about 25 deg. to 30 deg. N. No. 2 tunnel is 500 feet in length. At 480 feet from the mouth a flat fault dipping northerly at about 8 deg. cuts off the reef. Below this fault the reef has not been found. The continuation should be searched for by driving to the west.

No. 3 tunnel is 115 feet vertically below No. 2 tunnel and is 614 feet long. At 180 feet in from the mouth, the fault that cut off the reef in No. 2 level is met with. In this case the "leg," 2 inches thick, which has been stoped for 60 feet, is cut off also.

A cross-cut is being driven out west from the No. 2 tunnel with the object of cutting a reef that shows at the surface about 400 feet west of the other reef or east leg.

The most important work in this mine would be to pick up the faulted portion of the reef under the flat fault. To do this, work should be started in the country under the fault, and the drive should be across country to the west. There have been extensive workings on the top of the hill near the south end of the lease about 2,100 feet above sea-level. These workings are on the rise of the pitch from No. 1 tunnel workings, and they should afford a clue to the direction in which further exploratory work should be done. In the tunnels, if the reef can be recovered below the fault, drives should be extended southward in centre country so as to discover any other saddle reefs.

The Star of the West Extended Mine, Kevington.

The Star of the West Extended mine adjoins the Star of the West mine on the north. It is worked by two tunnels driven in on the west side of Mack's Creek in a westerly direction. No 1 tunnel is 150 feet higher up than No. 2 tunnel. At the mouth of No. 1 tunnel the beds of sandstone and slate dip west at 80 feet in from the mouth. At 180 feet in, the Eureka reef was cut and a level was driven on it north for 180 feet and south for 220 feet. The country dips 30 deg. W. and pitches north. One hundred and sixty feet south of the cross-cut a winze has been sunk to No. 2 tunnel. At 75 feet down the winze is an intermediate level. A pitch of auriferous quartz was worked down the winze. It is only a few feet long in the upper part, but lengthened out to 40 feet lower down, though in this part the rich shoot was not more than 10 feet long.

In the intermediate level the north drive is 68 feet long and the south drive 70 feet. Portion of this was worked. The feature is that the auriferous stone consists of irregular quartz spurs intersecting broken country rock and the gold is very irregularly distributed in the quartz. At the south end of the south level the beds on the east side dip east and those on the west side dip west. They do not bend over as an arch, but there is a fault down the centre dipping slightly to the west and the broken ends of the beds are bent up against each other along this fault line. About 100 feet west of the Eureka reef, Hayward's reef was cut by the tunnel. Southward along Hayward's reef and 70 feet from the tunnel is a winze that goes down to the No. 2 tunnel level. The quartz was stoped out from No. 1 level to the surface and down to No. 2 level. The strike of Hayward's reef is N. 25 deg. W., dip 70 deg. W. There is an excellent wall and the reef conforms to the strike and dip of the country.

No. 2 tunnel bears W. 10 deg. S. and is 1,000 feet long. At 514 feet from the mouth is the Pig and Whistle line of reef conforming in dip and strike with the country rock, and 84 feet further west in the tunnel is the Eureka line of reef. The country dips west. On the Eureka line and 320 feet south from the tunnel is centre country with a well formed arch. Nothing of value was obtained in this south level. There is a rise up to No. 1 level. Hayward's reef is 98 feet west of the Eureka reef and in the level driven 160 feet south along this reef the shoot from No. 1 level is met with; this shoot continues for 50 feet further south. The reef does not appear to be conformable to the dip and strike of the country here.

One hundred and seventy-two feet westward from Hayward's reef is a dyke of dioritic character 3 feet thick, which dips west with the country rock. The Derby reef is 60 feet west of the dyke. A level is driven north

along this reef and at 117 feet the dyke was intersected, showing that it intersects the beds. In this mine, as in the Star of the West, the best way to prospect the country is by means of a shaft and crosscuts in centre country. The intersections of the dyke with the reefs require careful attention.

The New Dempsey Mine, Gaffney's Creek.

The New Dempsey mine is situate about three-quarters of a mile west from the Albion Hotel, Gaffney's Creek, and is about 2,200 feet above sea-level. The original workings are on a hillside on the west bank of a branch creek. The shaft has been sunk on the flat and is 240 feet deep. The country rock is Upper Silurian sandstone and slate beds. Curious nodular concretions containing iron pyrites were found in sinking the shaft.

At No. 3 level, 140 feet from the surface, the beds dip 70 deg. E. The reef, which strikes E. 35 deg. S., is met with 38 feet from the shaft in the east cross-cut. It is driven on south-east for 135 feet and northwards for 70 feet. The strike of reef along the 70 feet is about E. 20 deg. S. and the dip is 60 deg. E.; the quartz is about 4 feet thick. The manager states that this quartz yielded about $3\frac{1}{2}$ dwts. per ton. The shoots pitch in a northerly direction. Forty feet in southward from the cross-cut on the reef, a winze has been sunk 27 feet on the dip of the reef. Further south another winze has been sunk 20 feet. The quartz is said to be 3 feet thick and to carry gold to the extent of 1 oz. per ton in these winzes. At the face in the south level the quartz is 4 feet thick and is said to average 8 dwts. of gold per ton.

In No. 4 level there is a cross-cut east for 60 feet to the reef. The country rock dips west and the reef strikes about E. 35 deg. S. and dips E., and is 5 feet thick and said to yield 10 dwts. of gold per ton. The north-west level is driven 35 feet and the south-east level 5 feet. At the north-west end the reef is 2 feet wide.

A dyke 4 feet thick occurs in the old Dempsey's workings and the quartz reefs that were in contact with it yielded well. No dyke material was observed in the shaft workings and the country appears to be much disturbed. When the shaft is down another 100 feet or so, there will be better opportunities for ascertaining the structure of the rocks and relations of the reef and gold occurrences.

The New Home Rule Mine, Gaffney's Creek.

The New Home Rule mine is situate on the west side of Gaffney's Creek, about 3 miles from Knockwood, and at the same distance from Gaffney's Creek township. The battery, which is on Gaffney's Creek, is about 1,800 feet above sea-level. The main tunnel is about 25 chains north-west of the crushing battery and 700 feet above it. From the tunnel mouth there is an inclined tramway 1,340 feet long, then a level tramway for 8 chains, then a shoot 250 feet high down to the ore bins.

The tunnel is driven in westerly for 780 feet. At the surface the slate and sandstone beds of Silurian age are intersected by a dioritic dyke 4 feet wide. The soil is red. The reefs were originally worked on the

top of the ridge to the westward and about 400 feet higher than the tunnel. Where first opened the reef was known as the Transit of Venus reef and the quartz was richly auriferous. The shoot of gold pitches south and the continuation of this reef is being worked in the present tunnel.

The strike of the dyke is N. 20 deg. W. at 2 chains south from the mouth of the tunnel. At the mouth of the tunnel the beds dip W. at about 89 deg. and strike N. 20 deg. W.

At 150 feet in from the mouth of the tunnel the dyke was struck. It dips 47 deg. S.W. and strikes N. 35 deg. W. The pitch of the country and of the gold is about 18 deg. S. The dyke ranges from 4 to 5 feet thick. About 335 feet in is the Home Rule reef, a leg of quartz conforming to the strike and dip of the containing beds. This "leg" is about 2 feet thick where it intersects the dyke and is payably auriferous along the intersection.

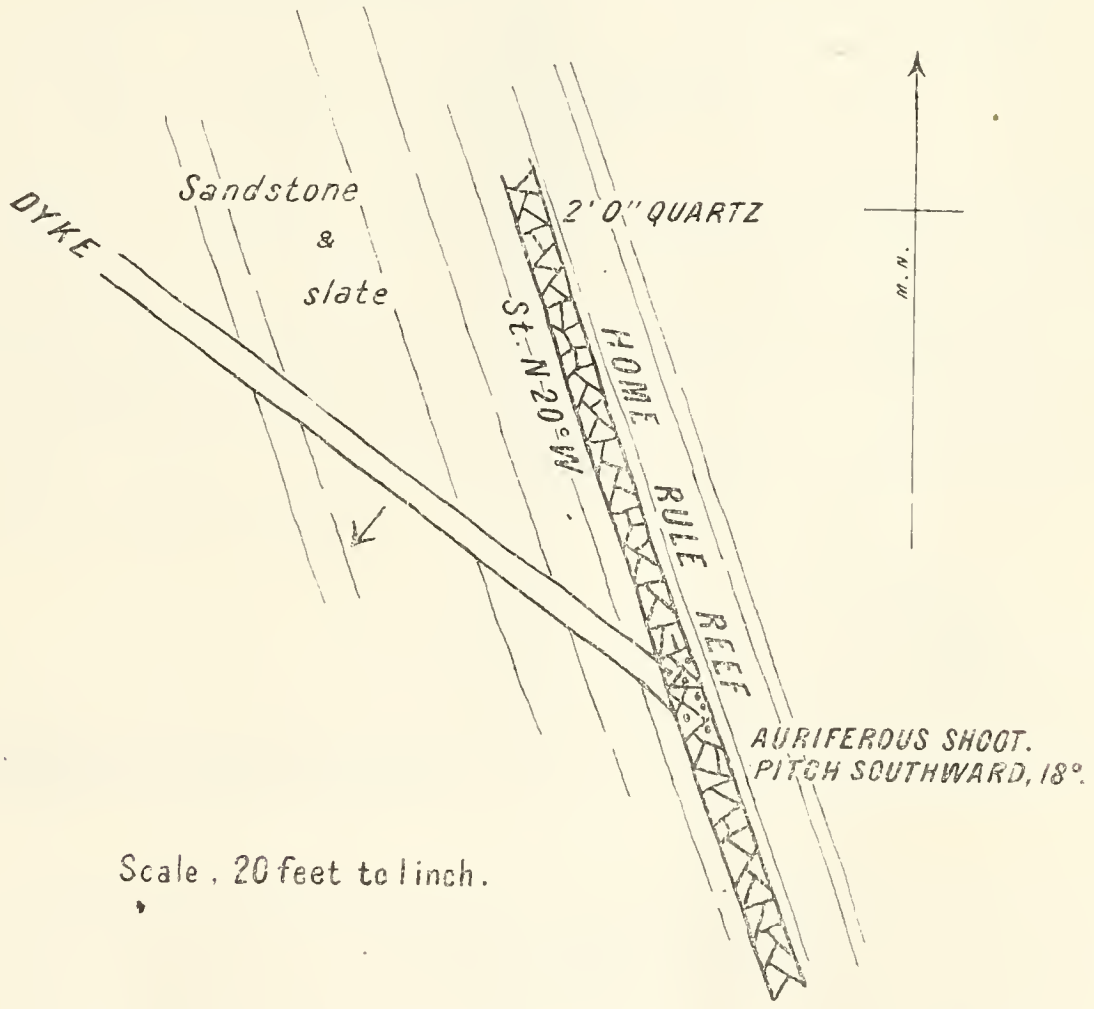
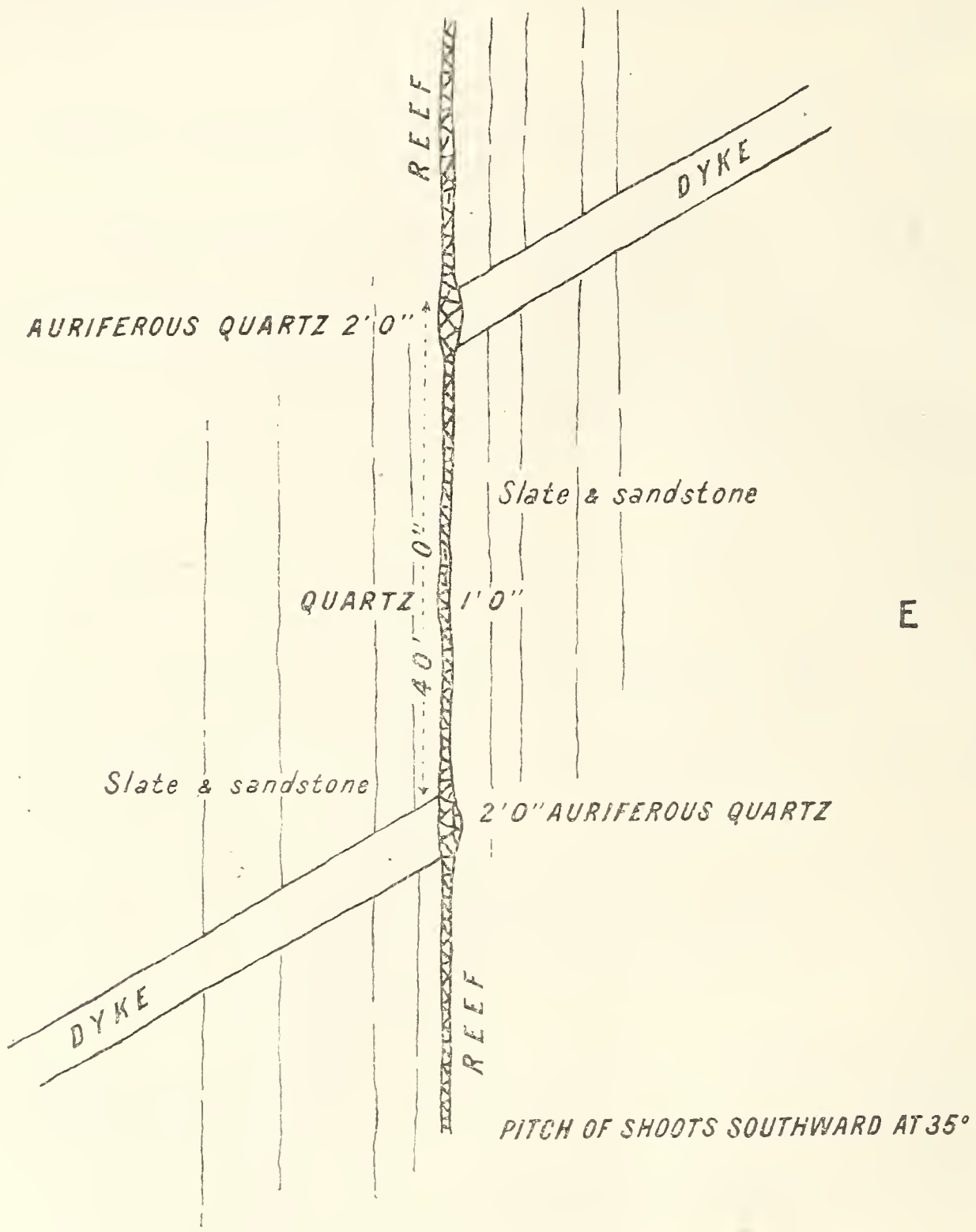


FIG. 11.

Plan of the Junction of the Dyke and Reef in the Tunnel, 335 feet from its Mouth, New Home Rule Mine.

About 500 feet in, the dyke intersects another reef about 1 inch thick and carrying rich gold at the intersection. The reef is about vertical and it cuts through the dyke and faults it. The dyke on the east side of the reef is about 40 feet higher than the dyke on the west side of it. The west and lower portion of the faulted dyke is in the tunnel level and is 4 feet thick. The pitch of the intersection of the reef and the faulted ends of the dyke is S. at about 35 deg. There are two lines of auriferous stone on this reef, the lower one where the lower portion of the faulted

dyke comes in contact with the reef on the west side and the higher one, 40 feet above, where the upper portion of the faulted dyke comes in contact with the reef on the east side.



Scale, 20 feet to 1 inch.

FIG. 12.

Vertical Section 500 feet from the Mouth of the Tunnel, New Home Rule Mine.

The gold obtained at this mine is worth £4 2s. per oz. Centre country has not been worked, but it is a feature that must be kept in view, as it is abundantly proved that saddle reefs occur at other mines in the district and that they are profitable to work for gold.

THE AI MINE, RASPBERRY CREEK.

The office of this mine on the side of the main road is 2,600 feet above sea-level and the No. 4 level is 200 feet higher. This No. 4 level has been driven through 200 feet of slate, then for some distance through the dyke which corresponds in character with the Morning Star dyke at Wood's Point.

From the level a winze has been sunk to a depth of 330 feet; it is 600 feet in from the mouth of No. 4 level and is known as No. 1 shaft. At 130 feet below the level in the winze there is a reef or "floor" which dips in a westerly direction at about 40 deg. The quartz averages about 2 feet in thickness. In this mine, as in the Morning Star mine, Wood's Point, the reef is richest in gold where it is near the wall of the dyke and the best quartz occurs where the fault in which the reef has formed has moved the upper portion of the dyke so that it overlaps the slate country below the reef. The reef in such a position with the dyke above and the slate below is most favorable for gold. The reefs cut diagonally right through the dyke (which is expanded at this part) to a length of about 350 feet by 150 feet at the widest part and measuring the reef on the incline. The whole of this for an average thickness of 2 feet is sent to the crushing plant. Beyond the dyke the reefs continue for 20 or 30 feet into the slate country where they split up and die out.

At 200 feet further in and south of No. 1 winze is No. 2 winze, which is 240 feet deep. At 90 feet below tunnel level is the 90-ft. "floor" or reef. It dips N. 20 deg. W. at 25 deg. and the average thickness of the quartz is about 8 inches and it carries profitable gold. At 60 feet the quartz reef dips southerly and averages 1 ft. 6 in. in thickness; it was richly auriferous. The total length of No. 4 level is 750 feet. Excellent returns are being obtained from this mine and there is a vast amount of work to be done in further exploration.

A remarkable feature is the abundance of crystallized quartz. Frequently spaces or "vughs" occur in the reef and in these beautiful masses of quartz crystals are found. Occasionally the gold is crystallized also and embedded in the quartz crystals. Iron pyrites, stibnite, and crystals of calc-spar occur. So far as the workings have continued the dyke rock is in a more or less altered condition, and the problem that has not been solved at Wood's Point will have to be faced here also, that is whether the gold will continue in the quartz reefs when unaltered dioritic rock is reached at greater depths.

Mackey's Quartz Mine, near Wood's Point.

Mackey's quartz mine is at the side of the Frenchman and about 6 miles from Wood's Point, on the Gaffney's Creek-road. It is in a deep gully on the west side of the road and is about 2,200 feet above sea-level.

The beds are slates and sandstones of Upper Silurian age. At the surface the rocks are yellow and grey in colour, and the soil is brown. The reef was first worked on the ridge south 150 feet above the gully. The mine is now worked by means of a tunnel driven from the gully-level for 82 feet S. 30 deg. W. where the reef was cut. The strike of the beds is about N. 25 deg. W., dip about 70 deg. E. The reef is 2 feet wide and has been driven on for 70 feet southward. The strike of the reef is about N. 20 deg. W. At the southern end of the drive the quartz thins out to a few inches. The manager informed me that 20 tons of quartz from this part of the mine gave 70 ozs. of gold when crushed. The dip of the reef is east at the rate of 82 feet in the 135 feet of sinking which connects this level with surface workings. The pitch of the quartz shoot is southward.

Northward from the crosscut the level is 134 feet long with the reef all the way about 2' feet wide; in the north face the reef is 6 inches wide. It is not quite clear whether the reef conforms in strike with the containing beds.

At the junction of the crosscut and the levels a winze is sunk 55 feet deep. The reef is stated to be 1 ft. 6 in. thick. As the dip of the reef is eastward and the pitch southward and the present tunnel is the deepest that can be driven to the reef, a shaft will be necessary to further develop the mine, and it should be sunk on the north side of the gully and to the south of the tunnel mouth, so as to be available for some time to come.

Centre country was not observed, but there is much scope for further prospecting. The country rock is of a favorable nature and there may be saddle reefs that would not be disclosed at the surface.

[*Report sent in 26.8.07.*]

THE TOORA TIN DEPOSITS.

By A. M. Howitt.

The area applied for as a mining lease by Messrs. Greville and Griffiths is south-west of the Franklin River Hydraulic Sluicing Company (late Great Southern Tin Mines), and is partly on a mining reserve and partly on allotment 17A, parish of Toora. A sketch locality plan is attached.

To indicate the extent of ground applied for, it is necessary to mention the approximate positions of the pegs.

South-east corner peg.—Near the junction of Doctor's Creek and Tin Mine Creek mining reserve.

South-west corner peg.—In southern portion of, and about half-way across allotment 17A.

North-east corner peg.—Near the intersection of Doctor's Creek and the southern boundary of J. Nichol's allotment 19B and in the mining reserve.

North-west corner peg.—In northern portion of and about half-way across allotment 17A.

I am informed that the area approximates 100 acres, and it is intended to keep as near as possible to the present pegs.

The Cainozoic (Eocene) deposits of drifts, clays, and gravels have a south-westerly course from the Franklin River Hydraulic mine and are well defined across Greville and Griffith's area, appearing to occupy a deep eroded channel through Jurassic sandstone and mudstone beds, which were dipping to the north where seen on the southern margin of the Cainozoic deposits. On Doctor's Creek the drifts, clays, and gravels can be seen right down to the creek. which is 303 feet above sea-level.

Proceeding west up a somewhat steep spur past the 62-ft. shaft and on to the top of the spur I took another aneroid reading and registered 440 feet above sea-level, therefore making a thickness of at least 147 feet of drifts, clays, and gravels.

These deposits then trend on in a south-westerly course across a deep scrubby gully and on through Johnson's allotment 17A to the western end of the area pegged, where a land-slip has occurred and shows the drifts at a slightly lower elevation just before the slope down to Tin Mine Creek commences.

Already Greville's party have sunk several shafts along the course of the deposits on that portion of their area which is in the mining reserve.

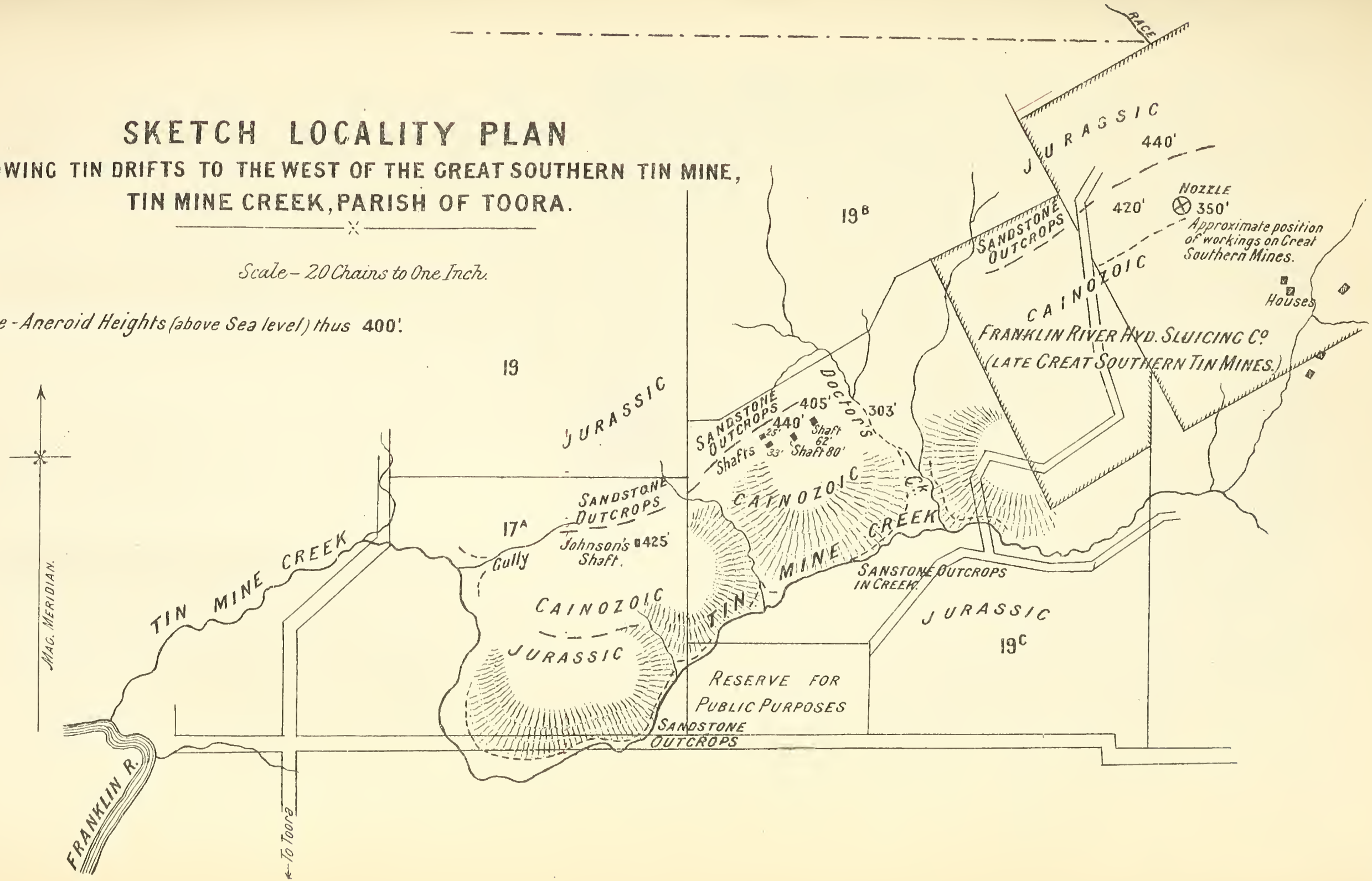
The following is a brief reference to each, going south-west from Doctor's Creek.

SKETCH LOCALITY PLAN

SHOWING TIN DRIFTS TO THE WEST OF THE GREAT SOUTHERN TIN MINE, TIN MINE CREEK, PARISH OF TOORA.

Scale – 20 Chains to One Inch.

Note - Aneroid Heights (above Sea level) thus **400'.**



BRITISH MUSEUM
NATURAL HISTORY

The 62-ft. shaft has been approximately located on the sketch plan by several compass bearings from known points. It has now fallen in at the bottom and only 45 feet of the drifts and clays are exposed. From top to bottom I procured an average sample right down the side of the shaft. (Assay No. 20.) The other samples taken from this shaft were as follows:—

Assay No. 21.—From nice white drift on dump (stated to have come from 60 feet deep).

Assay No. 22.—Average around the dump (this would mostly be from the deeper drifts).

Assay No 27—Taken from fine white drift, showing much tourmaline. (Mr. Graham, who sunk the shaft, informed me that this was from a depth of 55 feet, where the drift showed thin streaks of tin oxide.)

The section exposed in this shaft from the top downwards is as follows:—Light-brown drifts containing tourmaline, titaniferous iron, and some zircons; then stiff white clays of varying thickness and barren of tin oxide, followed by whiter drifts with rounded gravel containing more tourmaline, and, I am informed, richer in cassiterite.

From this shaft a few large concretionary iron nodules similar to those occurring in the drifts at the Franklin Hydraulic Sluicing mine were obtained. On fracturing some of them they proved to be composed of iron pyrites in the centre.

The 80-ft. shaft is $3\frac{1}{2}$ chains up the hill, and bearing S. 44 deg. W. from the 62-ft. shaft. This shaft, although sunk deeper, does not show the drifts at as low a level as the 62-ft. shaft, where the surface level is 35 feet lower down. It has more close timbering, but has also fallen in at the bottom. The 62-ft. shaft was therefore the best to go down. Samples taken from the 80-ft. shaft were as follows:—

Assay No. 23.—Samples of brown drift from the dump, showing a little tourmaline. (I was informed that this came from above the stiff pug, between the surface and 30 feet deep.)

Assay No. 24.—White drift from dump, said to have come from 60 feet, 70 feet, and 80 feet deep.

Three and a-half chains further on and on a bearing of W. 17 deg. S. a shaft has been sunk to a depth of 33 feet, I am informed.

It is now full of water within a few feet of the top, where it shows nice drift.

Assay No. 25.—Samples taken all round the dump.

Another shaft about 25 feet deep was sunk 1 chain to the north of the 33-ft. shaft. This is also full of water and not far from the Jurassic bedrock. Proceeding south-west a deep scrubby gully is met which crosses the drifts nearly at right angles; then on through Johnson's allotment 17A the drifts, clays, and gravels show for a greater thickness up the spur. In this allotment there is an old shaft now filled in to within 6 feet of the top.

Assay No. 26.—Samples from side of this old shaft.

In the area applied for by Messrs. Greville and Griffiths there are extensive deposits of drifts, clays, and gravels somewhat similar and continuous with the deposits now being worked by the Franklin River Hydraulic Sluicing mine, but whether they are as rich in tin bearing drift has yet to proved. The

assays will be completed shortly and these should give the value of the drifts, &c., close to the shafts. But with extensive drifts, clays, and gravel such as those occurring in this area, and where the cassiterite may be payable in some places and unpayable in others, it is necessary to put lines of bores down across the deposits to determine the varying depths to bedrock, and whether there are one or more false bottoms, and to enable an average value to be obtained by carefully sampling the bore cores.

Report of the Mines Department Laboratory on samples 20 to 27—

The eight samples consisted of quartz sand, with tourmaline and a little cassiterite. They were each washed down and the amount of concentrates recovered was weighed. This was then assayed for gold and tin.

No.	Concentrates Per cent. of Original.	Gold.		Tin.	
		Per Ton, Concentrates.	Per Ton, Original.	Lbs. per ton Concentrates.	Lbs. per to Original.
				lbs.	
20	0.57	trace	trace	1.32	.0075
21	1.5	2 oz. 2 dwt. 10 grs.	0 oz. 0 dwt. 16 grs.	4.03	.0605
22	0.94	trace	trace	5.20	.0493
23	1.75	2 oz. 17 dwt. 11 grs.	0 oz. 1 dwt. 5 grs.	1.52	.0268
24	1.34	Nil	Nil	1.68	.0224
25	1.44	Nil	Nil	0.58	.0075
26	0.97	trace	trace	4.80	.0469
27	3.27	trace	trace	2.44	.0786

[*Report sent in 18.1.07.*]

THE CHILTERN VALLEY GOLD MINE, No. 2 SHAFT, AND THE GOLDEN BAR MINE, CHILTERN.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The Chiltern Valley Gold Mine.

No. 2 shaft of this mine reaches bedrock at 303 feet and its total depth is 363 feet. The levels extend for a length of 2½ miles. The reef levels are driven from the bottom of the shaft and the wash dirt levels are 60 feet higher up. The whole of this mine is laid out in a systematic manner on the plan of having the lower level for drainage, haulage of wash dirt, ventilation, &c., and the upper levels for escape ventilation and transport of timber. The manager, Mr. John Cock, was the first to introduce this method of working deep alluvial leads in this State.

The alluvial deposit consists of about 2 or 3 feet of wash-dirt, in which moderately rounded quartz pebbles are embedded in granitic drift that is adhesive through the presence of a small proportion of clay.

It is stated by Mr. Cock that the shaft was sunk through material that largely consisted of granitic detritus. The wash-dirt consists of quartz pebbles and boulders that range from 1 cwt. downwards but the great bulk of them run from 1 to 4 lbs. in weight; they represent the quartz veins that traversed the Ordovician slates and sandstones before they were denuded. All the softer material has been ground away; the present course

of auriferous gravels represents the former course of the stream that flowed down the valley. All the detrital matter which covers the gravel to a depth of 300 feet has accumulated since Newer Pliocene times, and the granite area has contributed by far the larger portion of the material under which the old river bed lies buried.

The relations of the hills to the valleys when the ancient river flowed over the quartz pebbles that now form the wash-dirt, must have been vastly different to the relation of these same hills to the present water-course.

When the auriferous gravel was deposited, the ancient river bed was not only 300 feet below the bed of the present water-course, but the hills were probably 300 feet higher than they are present, and it is the material derived from the denudation of the hills since the old valley was excavated and the gravel laid down, which has sufficed to fill the valleys and cover the wash-dirt to a depth of 300 feet.

The ancient hills then probably rose 600 feet higher above the old river bed than the existing hills rise above the modern river.

When the gravel was deposited, the extreme limit of denudation had been reached, and the valleys were scoured out to their greatest depths and except in the bottom of the river course, the bare rocks were exposed. An elevatory movement of the southern portion of the continent may have been the cause.

A further oscillation by which the land was depressed relatively to the ocean to the extent of 300 or 400 feet may have been the cause of the accumulation of the great deposit of silt above the gravel.

Although the alluvial deposits consist principally of granitic material, the bedrock on which this material rests is slate and sandstone of Ordovician age. In the reef-drives 60 feet below the surface of the bedrock, the beds are yellowish and reddish altered slates and sandstones with much limonite in parts, while in the wash-dirt levels driven partly in the top portion of the Ordovician strata at its contact with the overlying wash-dirt, the sandstones and slates are of very light-yellow colour, much altered and reduced to soft pipeclay in part.

The gold obtained consists of partly water-worn grains and pellets seldom weighing up to a few pennyweights. It is of good quality and worth over £4 2s. per oz. Probably some of the attrition of the particles of gold is due to the treatment it receives in the puddling machines. About 2 feet of the bottom of the gravel is sent to the puddling machines, and at the same time a few inches of the floor of the lead which consists to a considerable extent of "pipeclay" or slate which has become altered and softened to the consistency of clay.

It is worthy of note that in a general way the nature of the gold in alluvial wash may be told from an examination of the pebbles. If these are angular or sub-angular the gold will be sharp and hackly, if moderately well rounded the particles of gold correspond. If most of the pebbles are moderately well rounded, but occasional pebbles of completely rounded character are met with, so among the moderately rounded gold some completely rounded grains will occur. If the gravel is highly rounded, then the gold particles will be also thoroughly waterworn. The differences in the character as regards the degree of rounding and the quality as shown by the colour, as well as the differences of form, are of the utmost value to the prospector. There are distinctive characters in gold samples derived even from adjacent reefs or neighbouring gullies which enable them to be distinguished from each other.

Besides the ordinary water-worn gold found in the washdirt with quartz pebbles, a remarkably finely divided gold, called slum gold, is obtained from the slimes. This is so fine that if it once dries it floats on the surface

of the water. Under a lens it is clearly discernible that this gold is crystalline in character. It corresponds in appearance with the gold found in sandstone pebbles at the Caledonian Lead, Indigo, and probably it has had a similar origin, that is to say, the waters draining through the gravel were charged with a small proportion of gold in solution, and this solution when it came in contact with suitable conditions in the bedrock forming the floor of the lead or in pebbles lying on it, was deposited in a crystalline form of microscopic size. In removing the floor of the lead, this gold is most likely introduced into the puddling machine, and being in such fine particles, it escapes with the slimes. The presence of limonite appears to be favorable to the deposition of this form of gold, for it is always present in the bedrock and in the pebbles in which the gold has been crystallized and in contact with the minute crystals. Some of this gold was mounted for microscopic examination and measured by Mr. H. J. Grayson, of the Melbourne University, and he found that the particles range from $\frac{1}{1000}$ in. to $\frac{1}{10000}$ in. in greatest length. The most interesting feature about these minute particles of gold is that every one is a perfect crystal with sharp edges and polished faces.

Perhaps the best method of saving such finely divided gold would be to bring the slimes largely diluted with clear water over tables covered with cotton plush.

The length of the old river course opened up from this No. 2 shaft, and along which the width of the channel has been determined is 9,600 feet. The width of the wash-dirt ranges from 1,100 feet to 220 feet, averaging 577 feet. In the softer country the bed of the river was wide. Where the rocks were hard it contracted.

In the 9,600 feet length of the lead, taking the average width and an average thickness of 2 feet of wash-dirt, the total quantity of auriferous material is 410,311 cubic yards.

Although some gold occurs throughout the wash-dirt, it is not by any means evenly distributed, but as explained in my report on the Moolort mines, the wash-dirt that is worked on the inner sides of the elbows is far richer than the rest. In such mines it is desirable to obtain the wash-dirt from a number of faces at the same time so as to maintain an average yield of gold. In this mine nearly all the gold is within a few inches of the bedrock.

Besides gold in the wash-dirt, cassiterite is found in sufficient quantities to be of economic value. Titaniferous iron, topaz, both white and blue sapphire, and very occasionally ruby and corundum, and also garnet, black tourmaline, &c., occur associated with the gold, but only in very small well rounded pieces that are of no value. These have undoubtedly been furnished from the granite area, as they did not occur in the lead above the junction of the Barambogie branch, which drains the granite area. Diamonds were found in the Lancashire Lead workings at the head of Barambogie Lead, and it is reasonable to suppose that some may occur with the wash-dirt now being worked. The screenings from the black sand is where they should be looked for.

The Golden Bar Mine.

The total depth of shaft is 558 feet and the bottom level is 425 feet from the surface. From this level there is a cross-cut east 30 feet. The beds dip 49 deg. W. There is also a cross-cut west and at 140 feet in, No. 1 reef is cut. A level is driven northerly along the reef for 220 feet. The

quartz along this level ranges from 1 foot to 6 feet thick. Near the north end of the level the quartz shows gold freely, and at this point it is 1 foot thick. The strike of the reef is N. 10 deg. W. and the dip vertical. Strike of the sandstone and slate beds N. 40 deg. W., dip 85 deg. W.

At 198 feet in the north level from the crosscut, a west crosscut has been driven west for 36 feet. The beds here dip 86 deg. W.

From the west cross-cut at 140 feet from the shaft, a level extends southward 148 feet on No. 1 reef, and for 70 feet in, the reef has been stoped above the level. At the end of this level the reef is 9 inches thick. Between the shaft and No. 1 reef the country is much disturbed, and spurry country occurs for about 20 feet in one place.

In the west cross-cut 214 feet from the shaft is No. 2 reef. Its strike is N. 35 deg. W., dip 57 deg. W. In the level on this reef there is about 1 foot of quartz, &c.

[*Report sent in 19.6.07.*]

REEFS IN THE ROCKY POINT AND TWIST'S CREEK DISTRICTS, NEAR BEECHWORTH.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The Homeward Bound Reef.

This reef is situate on the west side of the Lower Nine-Mile Creek, about 6 miles in a direction a little east of south from Beechworth. It has been worked at intervals for over 40 years and has furnished a considerable quantity of gold.

The soil is deep red, and the country rock consists of Ordovician slates and sandstones of grey to yellowish colour. The strike of the country is N. 2 deg. W., dip 74 deg. W. The reef conforms to the strike and dip of the country. The pitch of the gold shoots is northward at a low angle. Gold from this mine is worth £4 3s. per oz.

A main shaft has been sunk on the reef for 675 feet on the dip. There are workings on the surface of the reef that define its course for some hundreds of feet north of the shaft and to the top of the spur.

From the side of the hill a tunnel has been driven for the most part on the course of the reef for 1,400 feet. This tunnel is about 400 feet on the dip below the collar of the main shaft. Above the tunnel there are three levels (two main levels and one intermediate level), and below the tunnel there are three levels, all of which are driven along the reef channel.

In the tunnel about 800 feet from its mouth, a cross-cut driven 54 feet west from the tunnel has cut a second reef in which there is from a few inches to 18 inches of quartz. This reef has been driven on along its course for 50 feet and it carries a little gold. To prospect the country the crosscut might be extended for another 200 feet in a westerly direction. The appearance of this reef warrants further testing, especially as it is practically intact so far as it continues towards the surface.

The main shaft is sunk to about 370 feet below the tunnel and in the bottom there is broken country indicating proximity to the great fault which has displaced the reef. This fault is met with in the tunnel at 150 feet from the end. The strike of the fault is S. 25 deg. W., dip 45 deg. south eastward. North of the fault the country consists of dark coloured slate with nearly vertical dip. A crosscut at 50 feet north of the fault has been driven 50 feet to the east, where the fault was again touched, and 30 feet to the west. The direction in which the lost portion of the reef should be looked for is to the north-eastward, but the extent of the throw is not known.

There have been three principal shoots of auriferous quartz worked in the reef channel south of the fault. No. 1 shoot was worked south of the main shaft, and Mr. Oates, the manager, informs me that the average thickness of the quartz was 3 feet, and the yields ranged from 2 to 3 ozs. of gold per ton; No. 2 shoot was worked to the north of the main shaft and the quartz averaged about $3\frac{1}{2}$ feet thick and yielded about 1 oz. of gold per ton; No. 3 shoot was on the north side of the shaft and below the main tunnel, and was worked down nearly to the level of the fault. The quartz was 2 to 3 feet thick and profitable to work. Altogether during the last 40 years a very large quantity of payable auriferous quartz has been won.

Portions of the reef south of the fault are still unexplored. The No. 1 level should be extended in a northerly direction to the fault, and No. 7 level should be extended southward to explore the channel of the reef in that direction for new shoots. The recovery of the faulted portion of the reef would have a most important bearing on the future of the mine, and it might possibly be more economical to prospect for it at the surface than underground. So far no attempt has been made to locate the lost portion of the reef beyond the two short crosscuts in the tunnel.

The reef conforms to the bedding of the strata and may therefore be classed as a "leg." The channel of this reef is very continuous and of permanent character. In the channel the shoots of quartz are of fair thickness and in parts these shoots have yielded very profitable returns. On the north side from the main shaft in the tunnel the quartz and mixed country rock is 20 feet wide at one place, and it carries a little gold all through. Nearer the surface and north of Burke's shaft the mixed quartz and country was stoped for a width of 40 feet and crushed with a small margin of profit.

Favorable conditions exist for economical mining at this locality and a ten-head battery driven by steam a few hundred yards away and lower down the slope is used for crushing purposes. There is a fair supply of fuel and abundance of mining timber close to the mine.

From this locality to Twist's Creek, a distance of about 3 miles in a northerly direction, is a tract of country deserving attention from the prospector. In the immediate vicinity of the Homeward Bound reef there is also country that deserves attention as shown by the recent discovery of a rich shoot of quartz near the Kerry Eagle mine.

The Kerry Eagle Reef.

This reef is about three-quarters of a mile a little west of south from the Homeward Bound reef. The tunnel is about 400 feet higher than the Homeward Bound tunnel. It is 1,400 feet long and cuts the country

diagonally with the reef at the end. The country rock is slate and sandstone similar to what occurs at the Homeward Bound mine. The strike of country, which is very hard, is N. 2 deg. W., dip 80 deg. N.W. The reef conforms to the country both in the dip and strike and has been worked above the tunnel for 200 feet north of the tunnel and for 200 feet south of it. The channel has been followed for 100 feet still further northward than the stopes. Southward the channel has been traced for 150 feet beyond the stopes. Below the level the reef has not been worked. At the south end of the level a winze has been sunk 20 feet. At the surface the reef was about 150 feet long, but it has widened out to 400 feet at the bottom level. From the surface to the tunnel level the depth is about 270 feet, and the whole has been stoped out.

The quartz is stated to have been from 6 inches to 18 inches thick and to have been very profitable to work.

To further develop this mine it would be necessary to cut down a shaft through the old stopes to the present level and then to sink on the reef below that level.

The quartz is crushed at the Homeward Bound battery and the two reefs could be advantageously worked together.

The following table gives the returns from the Homeward Bound, Homeward Bound Extended, and Kerry Eagle reefs:—

Year.	Tons of Quartz.	Gold.		Depth in Feet.
		ozs.	dwts.	
Homeward Bound, Beechworth.				
1864 ..	45	137	2	300
1865 ..	96	156	4	300
,, ..	276	394	9	300
,, ..	776	894	0	320
,, ..	500	525	0	340
1866 ..	550	495	0	400
,, ..	220	132	0	420
,, ..	65	42	5	420
,, ..	60	91	0	..
,, ..	3	14	0	..
1867 ..	43	40	17	420
,, ..	126	92	15	420
,, ..	80	110	0	..
,, ..	185	168	0	..
1868 ..	80	32	0	..
,, ..	200	48	10	430
,, ..	70	22	10	490
1869 ..	157	199	16	240
,, ..	30	12	0	..
1870 ..	58	74	0	50
,, ..	70	24	10	40
1873 ..	250	592	0	430
Homeward Bound, Beechworth—*continued.*				
1874 ..	300	345	0	430
,, ..	160	152	0	430
,, ..	155	272	10	430
,, ..	525	476	0	430
1875 ..	600	340	0	470
,, ..	518	284	18	470
,, ..	250	150	0	500
1876 ..	20	20	0	..
1878 ..	338	195	0	550
,, ..	160	52	0	600
,, ..	300	175	0	600
1879 ..	175	96	5	600
,, ..	460	166	15	600
,, ..	460	189	15	600
1880 ..	96	134	8	250
,, ..	232	249	0	350
1881 ..	90	11	5	500
1884 ..	6	14	18	250
1887 ..	27	6	16	..
,, ..	130	52	0	700
,, ..	42	34	0	740

HOMEWARD BOUND, ETC., REEFS—*continued.*

Year.	Tons of Quartz.	Gold.	Depth in Feet.
		ozs. dwts.	
HOMEWARD BOUND, BEECHWORTH—*continued.*			
1888 ..	74	53 13	760
,, ..	56	32 5	..
,, ..	73	116 6	800
1889 ..	53	33 16	800
,, ..	240	69 17	800
1890 ..	70	12 0	800
,, ..	34	11 6	640
,, ..	35	42 0	550
1891 ..	15	4 6	800
1894 ..	12	2 5	..
HOMEWARD BOUND, LTD.			
1902–3..	4,678	870 9	..
1903–4..	1,475	328 5	..
1904–5..	4,805	1,003 16	..
1905 ..	1,700	315 4	..

Year.	Tons of Quartz.	Gold.	Depth in Feet.
		ozs. dwts.	
KERRY EAGLE.			
..	149	548 18	80
..	140	176 0	100
..	113	116 0	115
..	47	44 13	80
..	58	29 0	..
..	30	25 10	80
..	10	6 0	80
..	160	105 0	100
..	85	110 0	100
..	82	178 10	160
..	180	214 0	150
..	225	255 0	200
1894 ..	223	113 12	300
1895 ..	113	53 9	270
,, ..	260	123 0	300
,, ..	250	121 0	300
1896 ..	45	38 10	300
,, ..	38	25 0	..
,, ..	15	6 0	..
,, ..	60	36 0	..

THE FRIDAY REEF.

About 1 mile northward from the Homeward Bound Reef, Rocky Point, some shafts have been sunk on the Friday reef and it has been stoped from the surface to a depth of 30 or 40 feet. The soil along the reef course is red and the country rock is slate and sandstone similar to that at the Homeward Bound reef, Rocky Point. The strike of the country rock is N. 10 deg. W., dip 70 deg. W. The reef which consists of 3 inches of laminated quartz conforms to the country in dip and strike and has well defined walls. This line of reef is said to be traceable for 3 miles. The Homeward Bound reef, Twist's Creek, and the Little Tunnel reef in same locality are said to be on the same channel.

THE BIRTHDAY AND DANISH REEF, TWIST'S CREEK.

About a quarter of a mile south-easterly from the small battery furthest up Twist's Creek, the Birthday and Danish reef has been worked over the top of a hill for several hundred feet in length. The soil is red and the country rocks are slates and sandstones (Ordovician) of yellowish colour which strike N. 10 deg. W. and are about vertical. The quartz reef is about 8 inches thick and conforms to the bedding of the country, and the quartz is said to have yielded $2\frac{1}{2}$ ozs. of gold per ton. This reef has not been worked below water-level.

The Fanny Elizabeth Reef.

A short distance to the east of and parallel to the Birthday and Danish reef is the Fanny Elizabeth reef. It appears to be much less regular and has been worked here and there for a few hundred feet in length.

The Carney Reef.

About half-a-mile south-west from the small battery, Twist's Creek, is the Carney reef. A tunnel has been driven in and the reef worked to that level for 400 or 500 feet in length for yields of from ½ oz. of gold per ton upwards.

The Homeward Bound Reef, Twist's Creek.

The Homeward Bound reef is about half-a-mile south from the upper battery at Twist's Creek. A long tunnel has been driven in to the reef from the east, and a considerable amount of work has been done with profitable results. This reef is considered to be continuous with the Friday reef, and also with the Little Tunnel reef further north. The reef below the tunnel level is said to be untouched.

The Little Tunnel Reef, Twist's Creek.

The strike of the Little Tunnel reef is north, dip about vertical. The country rock consists of slates and sandstones of yellow colour and the soil is red. The reef conforms to the strike and dip of the country. The walls are 15 to 20 feet apart with quartz from 1 foot to 3 feet thick on each wall, and a belt of crushed country rock divides the quartz veins. Thirty or forty years ago this reef was actively worked and a great deal of gold was won. The workings extend for 500 feet north of the gully and for 100 feet south of it and down to water-level, and for 100 feet in length along the reef, and to a depth of 40 feet below the tunnel level. The Excelsior and the Non Pariel reefs are considered to be the northward continuation of the Little Tunnel reef. Gold from the latter reef is worth £4 1s. per oz.

The Big Tunnel Reef.

Further west and about a quarter of a mile up the gully from the Little Tunnel reef is the Big Tunnel reef. The strike is north and south, dip about vertical and the reef conforms to the country in dip and strike. The country rock is yellowish sandstone and slate. The quartz averaged about 2 feet thick and yielded up to 1 oz. of gold per ton. This reef has been worked for a length of 300 feet and down to the tunnel level.

The Wallace Reef.

About 500 yards west of the Big Tunnel reef is the Wallace reef. The quartz is stated to have been up to 4 feet thick, but 1 foot was taken for crushing. It was worked to water-level and for a length of about 300 feet.

The Iron Hand Reef.

Three hundred feet east of the Little Tunnel reef and parallel to it is the Iron Hand reef on the course of which work has been done at intervals for a length of 400 feet on the north side of the gully. The strike of the

reef is north and south, dip slightly to the east. The quartz is about 2 feet thick and yielded about half an ounce of gold per ton. The country rock consists of yellowish sandstone and slate of Ordovician age, and the reef conforms to it in dip and strike. The soil is red.

There are two small batteries at Twist's Creek that crush for the public. The charge is 8s. per ton. With the exception of the Little Tunnel reef where two miners are at work, and the Go Ahead reef where six men are employed, little is being done on the other reefs, and this field, which is the best for reefs anywhere around Beechworth, and from which a great deal of gold was formerly obtained, is almost deserted. Besides the opening up at lower levels of reefs which have been found to be richly auriferous at the surface, there is scope for the miner in searching for and opening out other reefs than those already proved. The township of Yackandandah is only about 4 miles to the eastward of Twist's Creek.

The Go Ahead Mine.

The Go Ahead mine is situated about half-a-mile W. 30 deg. N. from the upper battery, Twist's Creek. Three parallel lines of reef are being developed here. The most eastern is the Keep It Dark reef. The quartz is about 6 inches thick and has been worked for about 400 feet in length. The strike is N. 10 deg. W., dip about vertical. The Go Ahead reef is nearly vertical, but dips slightly west. The quartz is from 1 to 3 feet thick and has been worked for 200 feet in length. The last crushing of 56 tons yielded $3\frac{1}{2}$ ozs. of gold per ton. Forty tons now at the battery ready for crushing is expected to yield 3 ozs. per ton. It has been worked down to a depth of 60 feet, where a fault dipping 45 deg. W. was encountered. It is yet to be decided whether the Go Ahead reef above the fault may not be the upper portion of the Scandinavian reef which was worked further west.

The Scandinavian reef is the most westerly of the group. Its strike is about N. 10 deg. W., dip slightly to the west (the three reefs are within a belt 50 feet wide). The quartz is 4 feet thick and is said to have yielded 1 oz. of gold per ton. The reef has been worked for about a quarter of a mile in length, and down to 300 feet in depth near the main shaft. Most of the workings do not extend below 70 feet from the surface. It is reported that from the deep shaft 5,000 tons of quartz yielding 1 oz. of gold per ton were crushed.

The Polar Star Reef.

One mile north from Twist's Creek is the Polar Star reef. worked by a tunnel from the south. The strike of the reef is north and south, dip 85 deg. E. The strike of the country rock is a little west of north, dip 50 deg. E., pitch northward at 20 deg. The country consists of yellowish sandstone and slate and the soil is red. Along the surface there are two parallel lines of reef that have been worked for many chains and to a depth of 100 feet. The thickness of the quartz ranges from 6 inches up to 1 ft. 3 in., and it is highly charged with sulphides where worked in the tunnel. The shoots of gold are said to pitch south in this reef.

Excelsior Reef.

About a quarter of a mile westerly from the Polar Star reef are the old workings on the Excelsior reef. The strike of the reef is north and south, dip 80 deg. W., quartz 6 to 12 inches thick, yielding 3 ozs. of gold per ton. The shaft is sunk to 350 feet, and the reef worked out to 300 feet in depth This reef is supposed to be a continuation of the Little Tunnel and Friday lines.

The Milkman Reef.

Five hundred yards west of the Excelsior reef is the Milkman reef. Some shafts have been sunk along its course, the deepest about 250 feet. The strike of the reef is N. 5 deg. W., dip 80 deg. E. The quartz is 8 inches thick. The length of the workings is 250 feet.

[*Report sent in 19.6.07.*]

THE SERPENTINE AREA, WELLINGTON RIVER, GIPPSLAND.

By E. J. Dunn, Director, Geological Survey.

Glenmaggie is about 200 feet above sea-level, and the rocks consist of Ordovician sandstone and slate beds. The road to Mount Wellington crosses the hills northward from Glenmaggie for several miles, and then follows the Macallister River on the west bank and crosses it about 12 miles from the township. Between Glenmaggie and the river the higher ground is covered by an older basaltic flow, and the soil resulting from its decomposition is heavy, black, and fertile. The basalt begins just to the north of Glenmaggie and continues on to Mendowra, a distance of 8 miles. The road turns off the basalt here, but the basalt flow continues many miles to the northward of Mendowra before its source is reached. Mendowra is about 1,100 feet above sea-level. Ordovician slate and sandstone beds continue northward from Mendowra to within about 4 miles of Glenfalloch. They are covered first by Snowy River porphyries, &c., and then by red sandstones and conglomerates of Devonian age. The country around Glenfalloch consists of hills rising 1,000 feet and more above river level and built up of red sandstones, shales, and conglomerates, with pebbles of white quartz as a conspicuous ingredient. Glenfalloch is on the east bank of the Macallister River, 20 miles from Glenmaggie, and about 650 feet above sea-level. The river is a fine stream of clear water at this time of the year; it winds through extremely rich alluvial flats of which there is a considerable area. The greater portion of the hilly country where Devonian rocks prevail affords good grazing. Devonian rocks, for the most part highly inclined, continue on past Breakfast Creek (15 miles from Glenfalloch and 900 feet above sea-level). The track after leaving Glenfalloch follows the east bank of the Macallister River to where the Wellington River joins it, then follows the Wellington River. Half-a-mile below where the Wellington River branches the Devonian rocks with Snowy River porphyries give place to Ordovician beds. The track then follows the southern branch of the Wellington River, called the Dolodrook Creek, and about half-a-mile above the junction is Garvey's hut which was used for camping in.

Ten chains above the junction of the two branches of the Wellington River, Black Soil Creek runs into Dolodrook Creek, and 25 chains up this creek the serpentine rock is first met with. The serpentine crosses over a ridge and northern slope, and then crosses Dolodrook Creek where Thiele's

Creek joins it, and continues on the south side of Dolodrook Creek for about a mile. The total length of the serpentine country is about 3 miles, the greatest width is about 25 chains. The narrowest part is near the Graptolite Bluff where it is only about 2 chains across.

The serpentine has resulted from alteration of an augitic intrusive rock, some portions of which are still unaltered. Dark-green is the prevailing colour, but it is mottled with light-grey in places; red serpentines were not observed. As only a hurried visit was paid, there was no opportunity for ascertaining where the best qualities were to be found. This stone could be sawn into slabs for mantel-shelves, &c., and for internal decorations, and it would be easily worked and should take a high polish. Until a road for wheeled traffic is constructed the stone cannot be utilized. The actual distance is about 40 miles from Heyfield Railway Station. If the transport charges could be reduced to a moderate sum the working of this serpentine into useful and ornamental objects should develop into an industry.

Chrome Iron Ore.

A quarter of a mile east of the junction of Thiele's Creek with Dolodrook Creek, chrome iron ore crops out at the surface and masses of several hundredweight have been uncovered, although the little work done does not exceed 2 feet in depth anywhere. Pieces of this ore and finer particles in the serpentine occur over an area of about 50 acres. Much of the surface is covered with soil, and there is therefore a possibility of this ore being found in workable quantities, but prospecting work is essential, and this has not yet been done. Chrome ore is an essential for the manufacture of armour plates, and other varieties of hard steel and is the source of the chrome salts extensively used in dyeing and tanning and for pigments. It is also used as a refractory lining for furnaces and for manufacturing bricks for the same purpose. The demand is fairly constant. The price in 1906, varied from £3 14s. to £4 2s. per ton for 50 per cent. chrome ore. The work of prospecting could be now carried out to determine whether the ore is in workable quantities, but until a road is made it could not be profitably mined.

Magnetic iron ore occurs a little further to the east disseminated through the serpentine, but apparently only in small quantities.

Corundum.

A very interesting occurrence of corundum is associated with the serpentine, a few chains west of where Garvey's east boundary line crosses the serpentine. The most eastern block of corundum weighed about 3 cwt. It lies half embedded in the soil. Ten chains north-west a small block exposed at the surface was found; 4 chains north of the small block another small piece was found and five chains still further north the largest block, weighing about 5 cwt.. was found deeply bedded in the soil. No corundum has been found actually in situ and embedded in serpentine rock, but it should be found by carefully searching. It looks as though all the loose blocks found may have originated near the southern margin of the serpentine on the slope and they may have rolled down from there. The colour of the corundum is purplish and it is associated with a green mineral. Although so hard the surfaces of these blocks are covered by lichens. In 1906, 13,840 tons of corundum and emery ore and rock were used in the United States, valued at £95,730 or just under £7 per ton. Good qualities of massive corundum are worth considerably more than the average price.

The following is the result of an analysis made by Mr. A. G. Hall, at the Departmental Laboratory :—

SiO_2	...	...	3.90
Al_2O_3	...	...	85.11
Fe_2O_3	...	...	0.42
FeO	...	...	0.41
MgO	...	...	0.15
CaO	...	...	0.46
NagO	...	...	0.26
K_2O	...	...	0.23
H_2O+	...	...	7.03
H_2O-	...	...	0.07
CO_2	...	...	nil
TiO_2	...	...	1.05
P_2O_5	...	...	nil
SO_3	...	...	nil
Cl	...	...	nil
Cr_2O_3	...	...	1.40
NiO	...	...	nil
CoO	...	...	nil
MnO	...	...	nil
			100.07
Sp. gr.	...	...	3.580

Asbestos.

No good sample of asbestos was observed, but a stage in that direction was noticed, for a blade like arrangement was apparent in the serpentine at several points.

The serpentine is surrounded by stratified rocks that require some work to be done on them before their relations can be satisfactorily determined. At the junction of Thiele's Creek with Dolodrook Creek, there is an excellent section that Mr. E. O. Thiele has already drawn attention to. The serpentine is exposed for a few feet, then crushed serpentine for 5 feet and then follow slates dipping south-west at 85 deg., then beds of serpentine detritus, with pebbles of slate at intervals, and so on alternations of slate and conglomerate of serpentinous material for 48 feet away from the contact with the serpentine rock, then slate beds alternate with bedded finer serpentine material for a considerable distance, the beds becoming less serpentinous in character as the distance from the serpentine rock increases and the material becomes finer in grain. Twenty chains west of the junction of Thiele's Creek and Dolodrook Creek is a bluff of black slate on the bank of the latter creek. Graptolites are numerous in this black slate and Dr. T. S. Hall has determined them to be of Upper Ordovician age.

The section at the junction of Thiele's Creek and Dolodrook Creek shows that beds of slate alternate with beds of serpentinous material, ranging from fine mudstone to coarse material, and that in this serpentinous bed pebbles of slate also occur to form a conglomerate. It therefore appears probable that an intrusive rock cut through the Ordovician beds and subsequently became altered to serpentine, and when the serpentine and Ordovician rocks were denuded, the slaty beds were formed of material

derived from the Ordovician rocks and the pebbles of slate were also derived from that source, while the serpentine furnished the material that forms the great bulk of these sedimentary beds. The serpentine rock on what was the old surface is less compact and far more shattered than at a few feet lower down. The sedimentary beds now stand at an angle of 80 deg. to 85 deg. to the horizon, although they must have been laid down horizontally. This implies that great earth movements have taken place, tilting up not only the sedimentary beds, but also the serpentine rock and it is doubtless owing to this cause that the serpentine outcrop is exposed.

At Roan Horse Gully an exposure of grey limestone occurs with numerous fossils determined to be *Platystrophia biforata*, by Mr. F. Chapman, A.L.S., of the National Museum. It appears to be resting on the serpentine. It may belong to the series of beds exposed at the junction of Thiele's Creek and Dolodrook Creek where there is another limestone outcrop. A third outcrop occurs a few chains above the junction of Black Soil Gully with Dolodrook Creek, on the west side of the latter creek. These limestone outcrops all appear to be of the same age and the last mentioned is said to be traceable at intervals for a mile in a south-west direction. Eventually this limestone should prove of great value for building purposes and also for fertilizing the land.

A few chains up Black Soil Gully above its junction with Dolodrook Creek a band of red and grey jaspery rocks crosses the gully. Similar rocks are exposed at Garvey's hut where we camped. The relation of these beds to the Graptolite bearing black slates has to be worked out.

A thin deposit of well rounded pebbles occurs on the serpentine on the south bank of Dolodrook Creek and at a considerable height above it. A few chains west of the corundum locality and high up on the hills, a well rounded wash occurs, the pebbles formed of serpentine. A shallow hole has been sunk into this. In Dolodrook Creek, near the hut, there is a conglomerate in which small nearly spherical pebbles of serpentine are bound together with serpentine material; the pebbles and boulders are derived from the conglomerate as shown in this section.

Mr. Thiele has done some excellent work in exploring this out of the way locality, and he has embodied the results in three papers published by the Field Naturalists' Society.

[*Report sent in 2.10.07.*]

NOTES ON THE COUNTRY BETWEEN BAIRNSDALE AND BENDOC, GIPPSLAND.

By E. J. Dunn, F.G.S., Director, Geological Survey.

Bairnsdale is situate on Tertiary deposits of doubtful age. On the surface westward from the town coarse gravel deposits are abundantly present and are utilized in forming the roads. These gravel beds and beds of sand, &c., extend round McLeod's Morass on the west side and are well shown at Eagle Point. Beds of impure limestone containing abundant remains of marine fauna crop out on the road west of Bairnsdale. A great deal of marly material occurs with the limestone and this should form a

Sketch Plan of
THE SERPENTINE AREA
DOLODROOK Ck
GIPPSLAND.

SCALE. 40 Chains to 1 inch.

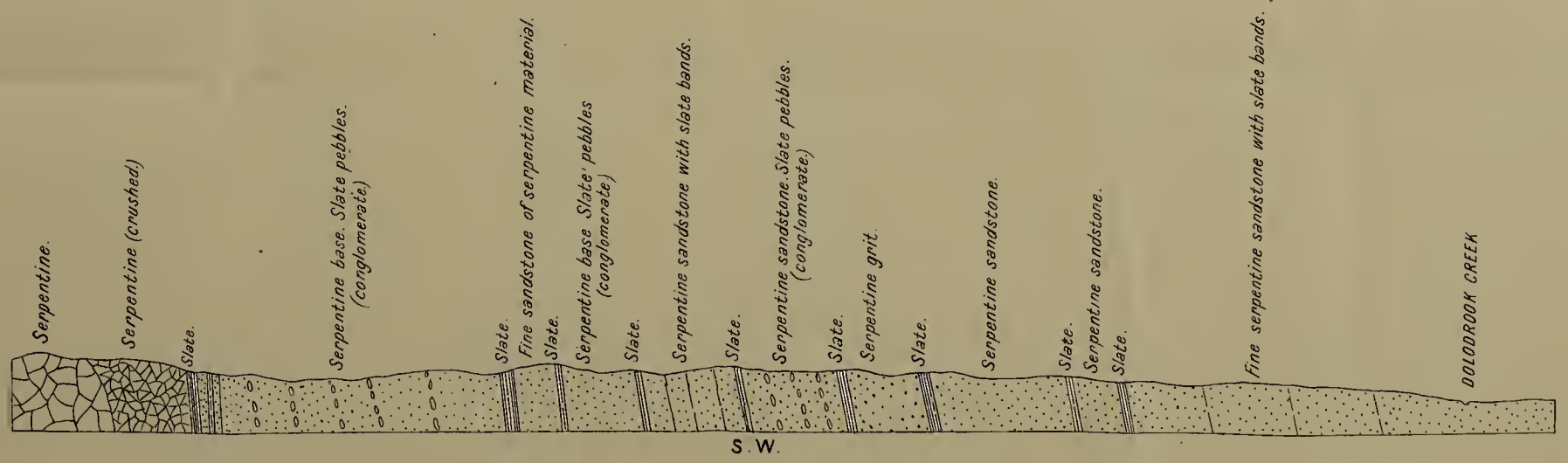
REFERENCE

Serpentine Limestone

Heights above Sea-level, 1900.

NOTE

Nº1. Limestone which extends for 1 mile further S.W.
" 2. Jasper, red and grey.
" 3. Corundum, loose block of about 5 cwt.
" 4. " small block.
" 5. " " "
" 6. " loose block of about 3 cwt.
" 7. Craptolites in black slate.
" 8 Limestone (fossiliferous).
" 9 Chrome Iron Ore.
" 10 Limestone (fossiliferous)



Section showing Sedimentary Beds resting on Serpentine.
Junction of Thiele's Creek with Dolodrook Creek.

Scale, 10 feet to 1 inch.

NATURAL

THE DELTA OF THE MITCHELL RIVER,

SHOWING ENCROACHMENT ON THE LAKE AREA.

SCALE — 80 CHAINS TO 1 INCH.

NATURAL HISTORY

rich dressing for the poorer soils. The recent alluvial soil deposited by the Mitchell River at Broadlands and along the course of the delta is very fertile, but the clearing of the timber and vegetation along the margins of the river is likely to cause serious expense in the future, as already the banks are being eroded where the vegetation has been removed. It is essential to Bairnsdale that nothing should impede the navigation of the river channel, and the best way to keep it open is to protect the banks by vegetation.

Among the most interesting features in the recent geology of the State is the formation of deltas by the Gippsland rivers that enter the lakes of East Gippsland, and the delta formed by the Mitchell River is distinctly the most striking example. At one period this river entered a lake that extended to where Bairnsdale now stands but by depositing its burden of silt it greatly reduced the area of the lake. McLeod's Morass is a portion of the lake which has been silted up and nearly converted into dry land, and a little artificial help would complete the work. The river has built banks for itself right out in the lake to where it impinged upon Eagle Point and was diverted in an easterly direction. The conversion of the lake into dry land is still going on. Where the river actually joins the lake there are wide shallows that are yearly becoming still more shallow, and every gradation may be seen from shallow silt banks entirely under water, mud banks partially exposed, and so on, to dry land. It is merely a matter of time when Jones' Bay will be entirely silted up with material brought down by the Mitchell River. The former extent of the lake may be traced out by the escarpment of Teritary beds. The processes now at work by which the Gippsland shore line is steadily advancing seaward explain the means by which the whole Tertiary area extending from the base of the hills seaward has been formed. The rate at which this encroachment of the land on the sea has progressed has been continually diminishing, because the inclination of the beds of the streams from this source to their mounths has been continually lessening as the length increased, and, therefore, the work done by water is not so great as in former periods when the beds of the streams were more highly inclined.

Swan Reach is 14 miles from Bairnsdale and 800 feet above sea-level; the country between consists of rocks of Tertiary age. Mundic Creek is 13 miles from Swan Reach. The country rock here is black slate and granitic dykes. The height is 1,000 feet above sea-level.

Nowa Nowa is but a few feet above sea-level. The country rocks have a Heathcotian aspect and much red jasper shews in the gravel of the river.

Hospital Creek is 6 miles from Nowa Nowa and is about 50 feet above sea-level. Between are Tertiary beds. The limestones are well shown along the banks of Hospital Creek, and there are abundant marine fossils such as huge valves of *Ostrea*, *Pecten*, &c., &c.

From Hospital Creek to Orbost the road lies over Tertiary beds and there is a steep descent from these down to the alluvial flats on the banks of the Snowy River. This stream rises in New South Wales and drains a very extensive area before it enters Victoria. For most of its length in this State it flows through a rocky gorge, and at this season of the year (April) at Mt. Deddick the stream could be almost stepped across. In the rainy season it sends down an enormous body of water. Where the river enters the Tertiary plains its whole character alters. It becomes more tortuous, and wide flats of amazingly rich soil flank its course. In flood time these flats are coated with fresh deposits of silt of a most fertile character gathered

from the black volcanic soil of Monaro, New South Wales. So much of this silt is being let down that I have been informed that, during the last 30 years, two sets of fences on the same line have been covered at Orbost, and the third fence is now erected. Nothing could exceed the productiveness of this soil, and maize is said to yield up to 140 bushels per acre. Since the marine Tertiary deposits were formed the Gippsland coast has been steadily rising. Orbost is only about 50 feet above sea-level. Right in the town is an inlier of Ordovician slate. In the cutting of the road leading down to the river from the west side, the marine limestone with fossils is exposed, and there are thick beds of gravel. At $5\frac{1}{2}$ miles north of Orbost and 300 feet above sea-level Tertiary rocks are present. At 7 miles from Orbost, Ordovician slate and sandstones are met with at 500 feet above sea-level. At 11 miles the height is 1,000 feet. These rocks continue to Granite Creek 3 miles south of Sardine Creek where it joins the Brodribb River. The granitic rock is a fine grained grano-diorite and it extends westward as a narrow belt 1 mile wide for 5 miles. The height at Granite Creek is 450 feet above sea-level. Sardine Creek, $19\frac{1}{2}$ miles from Orbost, is 300 feet above sea-level. The rocks are slate and sandstone (Heathcotian ?). The strike is W. 25 deg. N., dip N.E. Jansen's is 30 miles from Orbost, 900 feet above sea-level. The rocks are slate and sandstone (Ordovician). From Jansen's to Goonegerah (Reid's) on Brodribb River is 10 miles; there is grano-diorite with dykes the whole way. The height is 600 feet above sea-level. Mt. Ellery is south-east from Goonegerah and also appears to be grano-diorite. There is a remarkable rock perched on top. In Mt. Ellery Creek, 3 miles S.S.E. from Goonegerah, alluvial gold was worked for some distance. The gold was patchy but of excellent quality. Whelan's reef was also worked on a tract of Ordovician slate and sandstone between Mt. Ellery Creek and the Brodribb River. A ten-head battery driven by water power was erected to work the reef but it has since been removed. The quartz is said to have yielded up to 8 dwts. of gold per ton. This tract of country requires further prospecting. At Goonegerah the country rock is grano-diorite. Three miles from Goonegerah grano-diorite rock is present (height 1,000 feet above sea-level), and this continues to the foot of Little Bill (1,200 feet), 6 miles from Goonegerah. The top of Little Bill, 2,500 feet above sea-level, is still grano-diorite. From the top of Little Bill to Bonang (2,000 feet above sea-level), the rock is altered Ordovician slate and sandstone.

Eastward from Bonang the country is Ordovician with a belt of grano-diorite about half a mile to the east. On leaving Clancy's, Bonang, for Bendoc, sandstone and slate underlain by grano-diorite are first met with, and near the junction of the two rocks some quartz specimens rich in gold were found a quarter of a mile south of the creek, but although diligently searched for, the quartz vein was not discovered. The road turns eastward towards Bendoc and the grano-diorite is crossed for about 2 miles (height 2,700 feet above sea-level). Ordovician rocks are there met with. The top of the hill is 3,000 feet above sea-level and $2\frac{1}{2}$ miles east of Bonang. From this point to Bendoc Ordovician rocks occur. On the east slope of the mountain and north of the road, about half-a-mile, are alluvial gold workings that follow a creek flowing north-east to the Delegete River. Alluvial workings follow the course of this creek for many miles. The Bendoc River flows nearly north-east and alluvial workings extend right down the course of this river for 40 miles, and for 5 miles above Bendoc. Bendoc is on Ordovician rocks and these are auriferous. The strike of the beds is N., dip W.

[*Report sent in 18.3.07.*]

COPPER LODES AT SARDINE CREEK AND SNOWY RIVER.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The Sardine Creek Copper Lode.

The Booth's Fancy mine is situate on Copper Creek, a branch of Sardine Creek. Fourteen miles from Orbost on the road to Bonang is Calico Flat, the settlement nearest to the mine and the camp is 2 miles about N. 20 deg. W. in a direct line from Calico Flat.

The country rock where the lode has been found is grano-diorite with a small outlier of Heathcotian just where the shaft is sunk. These are cherty beds which strike N. 30 deg. E. and dip westward at 25 deg. Small quartz veins intersect the highly jointed rock. The strike of the copper lode is N. 5 deg. W. and its dip 70 deg. W. The lode has been opened along its length for about 70 feet partly by a tunnel driven northward for 50 feet. A shaft has been sunk right in the bed of the creek to a depth of 10 feet. At the bottom, in the south end of this, the lode is 12 inches thick; at the north end it is 7 inches thick. The ore appears to pitch northward. At the north end of the drive the lode is 8 inches thick. The footwall in the drive is granitic and very well marked. Lodes in this grano-diorite are likely to be very persistent and a shaft should be sunk a little further south so as to be out of the way of the water channel. The present shaft will have to be filled in and carefully puddled or it will be a source of trouble later on. The lode material consists of very good looking copper pyrites with iron pyrites and some galena. The lode appears to be persistent and is worth tracing out further, but the principal work to be done here is to sink on it and prove what it is like at a greater depth. At least 50 feet should be sunk here before the lode is driven upon. The nearness to the coast is a great advantage and a concentrating plant of a simple character should be erected to make the ore available for shipment to the smelting works.

McDougall's Copper Lode, Wallaby Creek.

McDougall's copper lode is 1½ miles south of Granite Creek in a creek about half-a-mile east of the Orbost-Bonang road at an altitude of about 500 feet above sea-level. The country rock is grano-diorite in the creek bed with Ordovician on the surrounding hills. The strike of lode is S. 20 deg. W. and its dip is eastwards. Dark chloritic quartz up to a few inches thick with copper pyrites disseminated through it occurs here, and is traceable for 2 or 3 chains. It would be advisable to trace out the direction further so as to find the site where the lode is strongest and then to open it out a little by sinking a few feet on it. A thin lode might pay in such a convenient site. The road is about 400 feet above the level of the outcrop in the creek bed.

John McRae's Copper Lode, Snowy River.

Samples of a copper lode situate about 16 miles from Orbost on the Snowy River were shown to me by Mr. John McRae. The lode material is the same as in the other cases, consisting of quartz with much chloritic material and copper pyrites disseminated through it. Only surface stones knocked off the outcrop were obtained, but some shallow trenches should be cut across the lode and a shaft should be sunk on the best portion of the outcrop so as to get below water level. Another lode is reported near this one.

[Report sent in 18.3.07.]

THE OAKLANDS SHAFT, NEAR BAIRNSDALE.

By E. J. Dunn, F.G.S., Director, Geological Survey.

"Oaklands," the property of Mr. J. S. Wilson, is in the parish of Moormung, 7 miles distant from Bairnsdale, in a south-west direction, and 4 miles from Hillside Railway Station. Here, right in the heart of the Tertiaries, a shaft has been sunk to a depth of 170 feet. At the surface is loose sand and this continues for about 40 feet in depth. Then mottled red and purple sandy clay was sunk through for 35 feet. In this a seam of gravel occurred with small well-rounded quartz pebbles. Below 75 feet coarse yellow sand was sunk through and then coarse grey sand composed principally of granitic material which continues to the bottom of the shaft. Thin layers of quartz gravel occurred and in them some fine colours of gold were obtained, so Mr. Wilson informed me. To the present depth the shaft has been dry, but in such a site artesian water may be expected, and to continue the shaft might involve risk. It is not at all likely that the shaft is nearly deep enough to strike bedrock. The occurrence of colours of gold in the layers of wash might be expected, but that any defined lead or gutter in which the gold would be concentrated sufficiently to be worth working should be found is very unlikely. If further work is to be done at this shaft it should be by boring with hand rods from the bottom of the shaft, and in doing this precaution should be taken in case an impervious layer should be drilled through and strong artesian water struck. Means for the escape for men and of recovering the tools should be provided. The site of the shaft is where an old sawmill stood on the edge of a lagoon.

[*Report sent in 12.3.07.*]

REEFS AT BENDOC AND BONANG.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The Homeward Bound Reef, Bendoc.

The Homeward Bound reef is situate about half a mile south of Bendoc. Its strike is about N. 20 deg. W. The shaft is about 90 feet deep, and the stone is said to have yielded well. From it an alluvial working called Chinaman's Gully trends in an easterly direction. Loch's Gully, which is also auriferous, begins from the same line of reef. It is a little further south than Chinaman's Gully.

The Bendoc United Mine.

About a quarter of a mile north of Bendoc a tunnel has been driven in to cut a reef worked profitably at the surface and down a shaft. The quartz vein was narrow but rich. The tunnel was not driven sufficiently far to cut the reef.

The Morning Star Reef.

This reef is about half a mile to the west of Bendoc. The shaft is 210 feet deep. It was worked for about 350 feet in length. The reef is about 8 inches thick. The country rock consists of yellow and grey sandstone and slate. The quartz is said to have yielded about 2 ozs. of gold per ton on an average, and the gold is worth £3 16s. 2d. per oz. The dip is W.

The Corner Stone Reef.

This reef is about 300 yards west of the Morning Star reef. The quartz is 8 inches thick. Gold was somewhat patchy in this reef which was worked for a length of between 500 and 600 feet. The shoots pitch N.

The Eclipse Mine.

This reef is about 2 miles in a southerly direction from Bendoc and 30 chains east of Bendoc River. Very rich auriferous quartz is said to have been obtained at the surface.

Clarkeville.

This old quartz mining camp is on the divide between the waters flowing into Bendoc River and Buck Creek. The height above sea-level is 3,400 feet. It is quite deserted at present.

The New North Discovery Mine.

The shaft is about 300 feet deep. About five years ago a Ballarat syndicate attempted to re-open this mine. The country rock is Ordovician slate and sandstone beds of grey and yellow colour. There appears to be an abundance of quartz here but the gold contents is said to be poor.

The Sunbeam Mine.

This reef is about half a mile from the New North Discovery mine in a direction a little west of north. The country rock about half-a-mile north of Clarkeville consists of grey sandstone much resembling the pebbles in Brodribb River at Goonegerah.

The Wagra and Waratah Reefs.

These reefs are about half a mile south-west from the New North Discovery reef.

The Jungle King, Jungle King Extended, Snow Storm, and South Discovery reefs are a little to the south and south-west of the New North Discovery reef. The Bendoc River rises at Clarkeville.

The Welcome Stranger Reef.

This reef is 4 miles from Bendoc on the Clarkeville-road. The poppet heads are still standing and very rich auriferous quartz is reported to have been found here. The country rock consists of grey sandstones and slates. The height above sea-level is 2,800 feet. The shaft is 105 feet deep and the reef is 10 inches thick.

The Star of Bendoc Mine.

About 300 feet south of the Welcome Stranger shaft is a whip over a shaft 90 feet deep. Another shaft has been sunk a little further to the south. Two hundred yards due south from the Welcome Stranger shaft some work has been done at the surface. A quarter of a mile north of the Welcome Stranger mine very rich auriferous quartz specimens were found but the reef has not yet been located.

The Oversight Reef.

This reef was worked a little further west from the Welcome Stranger shaft and some quartz of payable character extracted.

At Bendoc, Mr. Mahony, the Registrar, was good enough to accompany me to the several reefs and I am indebted to him for many of the particulars about them.

In the neighbourhood of Bendoc and Clarkeville there is a promising field for quartz mining. Several reefs have been opened up and worked successfully down to depths ranging to 300 feet. The upper shoots were worked but the necessary sinking and opening out for lower shoots has not been done, and at present quartz reefing is at a complete standstill. Besides the reefs already opened up and worked to shallow depths there is a good field for the prospector in searching for new reefs in this auriferous belt of country. North of Bendoc the country does not appear to be very favorable, but south of Bendoc to Clarkeville, and probably still further south, there is still room for the prospector so far as the natural conditions are concerned.

The difficulties to be faced are the remoteness of this locality, the poor means of transport and therefore the heavy charges for carriage of food, machinery, tools, &c., and in consequence the high prices for all necessaries. Although this is geologically a favorable district for quartz mining the disabilities are so great in prospecting and actually working the reefs that the present condition of mining is not to be wondered at, and though as a mining field the conditions are favorable, it is difficult to see how the mines are to be re-opened until there is better access to the field and consequently cheaper means of living and of working the various reefs known to exist.

The Rising Sun Reef, Bonang.

This reef is about 1¼ miles south-west from the hotel at Bonang and 2,500 feet above sea-level. The mine was extensively worked for many years and large yields of gold were obtained. The strike of the reef is about N. 20 deg. W., dip E. A shaft was sunk so as to cut the reef at 500 feet, and from that depth to the surface the reef has been stoped out. The shoot of gold dips north. At the shaft the reef is cut off by a fault which strikes north-east. The continuation of the reef on the north side of the fault is considered to be an outcrop of quartz about 20 chains distant, but this has not been sunk upon.

The outcrop of the Rising Sun reef was about 200 feet long and 1 foot thick. At 300 feet deep the reef is said to have been 2 ft. 6 in. to 3 ft. thick, and to have yielded 4 ozs. of gold per ton (gold worth £4 2s. 6d. per oz).

At 500 feet the reef is from 6 to 12 feet wide but poor in gold. Very little prospecting work appears to have been done, and the top shoot of auriferous stone has been worked out to the fault. The shaft should be sunk deeper to cut a second shoot.

South Rising Sun Reef.

A little to the south-west from the Rising Sun shaft are the workings of the South Rising Sun. A shaft is sunk 50 feet and a cross-cut 25 feet long has been driven to the reef which dips E. at about 75 deg. The reef is about 12 inches thick. Another shaft has been sunk and some exploratory work done by Mr. Pearce, and the quartz shows some gold, but there is no means of crushing the quartz within a reasonable distance. The country around is very favorable for auriferous reefs and the belt continues northward to the New South Wales boundary, but as there is no means at present of treating the quartz there is no inducement for prospectors. Southward this belt of country has not been much prospected, one reason being the depth of the surface soil. Close to the Rising Sun shaft and on the west side is the east edge of an outlier of basalt. The basalt continues

northward for about 2 miles and as isolated patches as far as Tubbut. The soil furnished by this ancient Tertiary basalt is exceedingly fertile and huge trees are growing upon it at Bonang. This flow was no doubt contemporaneous with the extensive area at Gelantipy.

[*Report sent in 15.3.07.*]

MT. DEDDICK AND ACCOMMODATION CREEK, EAST GIPPSLAND.

By E. J. Dunn, Director, Geological Survey.

Mt. Deddick.

Mr. Maryatt's (sen.) house is about 2 miles northward from Bonang, at a height of 2,000 feet above sea-level. From this point a start was made for the Mt. Deddick mines. For the first mile westward beds of Ordovician sandstone and slate in which some auriferous quartz veins have been found were traversed. Then a belt of basalt half-a-mile wide and some more Ordovician. Three miles from Maryatt's, grano-diorite begins and this continues the whole way to the Snowy River, except for a narrow belt of Ordovician on the west side of Cobanandra Creek, which is 5 miles from Maryatt's. The height of Cobanandra Creek, where crossed, is 1,800 feet. At Little Gulf (altitude 1,400 feet), 13 miles from Maryatt's, the rock is grano-diorite. At Jingallala Creek, which is about four miles from the galena mines, and at the north-west foot of Mt. Deddick, the country rock is grano-diorite. Height 800 feet above sea-level. Jingallala Creek runs into Deddick Creek before the latter flows into the Snowy River. Mt. Deddick forms a range of mountains, 2 or 3 miles long, which stand out prominently and which appear to be formed of grano-diorite, porphyry, &c. This range is bold and very rugged, and on the top there is said to be a plain of considerable extent.

Most of the Mt. Deddick silver-lead lodes occur right on the east bank of the Snowy River and about 2 miles below where Deddick Creek joins Snowy River. The Snowy River at this point is 750 feet above sea-level. The country rock in all cases is grano-diorite.

James' Lode.

This lode is being opened up about half-a-mile due east from the river. The strike of the lode is E. 15 deg. S., and the dip northwards. Where the shallow shaft is being sunk good lumps of galena are found on the surface and down on the wall. Half-a-chain east of the shallow shaft,

a shaft has been sunk 30 feet deep on the underlay. The dip here is 75 deg. N. About 5 tons of galena was got here on the surface in one bulge and in the bottom of the shaft 12 inches of solid galena is showing.

The Central Lode.

This lode crops out on the south-west side of the hill and higher up than the James' lode. Three tunnels were driven in towards it but neither was driven far enough to cut it.

The United Lode.

The workings on this lode are about 1½ miles east of the rivers. Height about 1,600 feet above sea-level. The strike of the lode in the tunnel is east and west, dip 55 deg. S. The hanging wall is well defined. The lode is from 6 to 12 inches thick. The grano-diorite on the footwall side has galena disseminated through it for several feet back from the lode. This appears to be a branch from the main lode which runs up the hill and is traceable to the summit further east. This main lode strikes E. 20 deg. N., and dips about 65 deg. S. It has been opened up by surface trenches for 300 yards from the tunnel in an easterly direction. At 1½ chains up the hill good galena from 1ft. 3in. to 2 feet thick is exposed in an open cut. This lode has not had much work done on it but well deserves to be more fully tested. A shaft would be better than tunnelling, as depth from the surface is what is required to show the nature of the lode where unaltered. The United is considered to be the most southern lode on this field. There are outcrops near the river that are considered to be the continuation of the United lode.

The Princess Lode.

The workings on this lode are about three-quarters of a mile north-west from the United workings and a quarter of a mile east of Snowy River. Height about 1,100 feet above sea-level. The strike of the lode is east and west, dip 80 deg. S. A shaft has been sunk for a depth of 55 feet and a winze goes down for another 15 feet from the bottom level. There are two shallower shafts further to the east. The lode has been worked for a length of 100 feet and many tons of galena have been sent away. The lode in the bottom of the winze is 1 foot thick. A fault striking north and south and dipping east cuts the lode off and throws it for a few feet.

North Mt. Deddick Lode.

The strike of the lode is W. 20 deg. N., dip 52 deg. N. The tunnel is 40 feet above the level of the river and is 100 feet long. The hanging wall is well defined but there appears to be little lode material. The grano-diorite footwall is impregnated for several feet from the lode with iron and arsenical pyrites and galena occurs also. This is on the west side of the Snowy River and right opposite the camp.

About 2½ chains higher up the gully and 100 feet higher than the above tunnel is a second tunnel 60 feet in length driven on the lode. Close to the mouth of the tunnel a winze has been sunk 30 feet deep. There are no well defined walls, but there are quartz veins in which galena and copper pyrites occur, together with stains of blue and green carbonate of copper.

Mt. Deddick Lode.

The main shaft is on the east side of the river and close to the bank and is 60 feet deep. There are copper pyrites and galena in the lode material which was only touched in the shaft.

Crossing the river near this shaft is a well marked lode, carrying galena in quartz veins and about 1 foot to 1ft. 6in. thick with about 3 inches of galena.

The country rock of the whole field is grano-diorite. Quartz veins are well marked and persistent in this country. The best galena deposits occur in quartz veins along the course of faults. Along these faults one wall is usually very well marked, while the opposite wall is not so well defined.

Even the casual examination shows that a great deal of indiscriminate work has been done on this field and that the money expended has not resulted in opening up the lodes to any great extent. So far the work done merely shows what the lodes are like near the surface where they are oxidized, but in no case have the lodes been opened up at sufficient depths to show what they are like where protected from atmospheric conditions. It is a safe rule in all such cases to endeavour to break into such lodes below water-level, where they have not been subjected for enormous periods to the oxidising and leaching effects of the atmosphere. At Mt. Deddick this could be accomplished by attacking the lodes at as low levels as possible and by sinking shafts instead of tunnelling. The operations so far carried on suffice to show that faults occur in the grano-diorite "country" that covers a wide area on the east side of the Snowy River and extends for a mile on the west side of the river. In these faults lode material has formed, generally of quartz and galena. Copper pyrites, iron pyrites, arsenical pyrites, &c., are also present in many cases though they do not all occur together. The faults appear to be of a persistent nature as the lodes are traceable very distinctly on the surface and for long distances. In some cases the walls of the lodes are mineralized and in depth such enlargements may carry valuable ore.

In places the galena in the lodes thickens out to 18 inches or 2 feet in width in the surface workings already opened. With a fair amount of silver and lead such a width as 1 foot of galena would be payable at present prices.

On the whole the aspect of the field is encouraging. The country rock (grano-diorite) is one in which the lodes are likely to continue to great depths. The lodes are traceable for considerable lengths and they are formed in rifts in the granitic rock. There has been movement and consequently there were spaces formed along the fissure wider in some parts, narrower in others. Besides this, the country rock itself is mineralized, and at lower depths valuable ore may form in such a way. There are many lodes in the granitic rock but only a few have so far been opened even to a slight extent. The lodes have not been tested below water-level when they can be seen in their best condition. Where the surface openings have been made very promising ore has been found. It is one of the features of silver lead lodes that they occasionally expand into "bonanzas" and these may eventually be found to occur. So far only thin lodes are exposed, but these may improve in depth.

It would be advisable in future operations to sink on some of the best lodes that crop out near the river bank. Such a shaft as the Mt. Deddick, which is already 60 feet deep, could be utilized. It should be sunk another hundred feet and then the lode should be driven along. When the lodes are in the hills it is desirable to trace them, if possible, into a deep gully and there to sink on them, placing the shaft out of the way of the water-course. Until these lodes are opened up below water-level their real character cannot be ascertained.

Very complete reports on this field have been furnished by Mr. James Stirling, Mr. Jenkins, formerly Metallurgist to the Mines Department, and by Mr. Ferguson, Assistant Field Geologist, but the position has completely altered since these reports were made for the prices of copper, lead, and silver have been greatly enhanced and at present prices lodes that were formerly impossible to work at a profit would give handsome returns.

The remote position of the Mt. Deddick field is an adverse circumstance, but for the present the point to be settled is whether the lodes contain sufficient ore to be worked profitably with better means of transport. If the prospecting operations prove that a mining industry could be established here cheaper transport would probably be provided in time.

Copper Lodes.

Besides the silver lead lodes of Mt. Deddick, which occur in grano-diorite, copper lodes have been discovered at several sites either in Heathcotian rocks or in grano-diorite. As both these rocks are widely spread in the portion of Gippsland traversed, there is much room for systematic prospecting for both classes of lodes, and with the present high prices of metals ores that would be worthless a few years ago could now be worked profitably. There is promise of much mineral wealth in this portion of Gippsland.

The Copper Lodes at Accommodation Creek.

The copper lode at Accommodation Creek lies eastward from Mt. Deddick and is about 8 miles from the junction of Deddick or Jingallala Creek with Snowy River. It is about 16 miles a little north of west from Bonang. The camp on Hell Hole Creek is about 1,300 feet above sea-level. The country rock consists of much jointed hard siliceous beds of Heathcotian (?) age. The strike of the lode in S. 30 deg. E., dip north-eastward at about 60 deg; strike of country rocks N. 30 deg. E., dip 50 deg. N.W. (at north-west end of copper outcrop being worked). The lode is marked by a strong outcrop for a quarter of a mile and Accommodation Creek in its serpentine course cuts through it three times in that distance.

The furthest opening to the north-west is on the north side of the creek and discloses 2 feet of quartz showing no copper ore. A couple of chains further along the lode and nearer the creek, the lode in the cutting shows 3 to 4 feet in thickness with good ore present. Still nearer the creek the lode is 5 feet thick. Green and blue carbonates and yellow copper pyrites occur for 30 feet along the hanging wall of the lode. Below these workings where the creek intersects the lode the latter is 50 feet wide with copper ores disseminated through it; the lode outcrops on the small hill and 4 chains further south is again crossed by the creek. At this site the

lode is strongly marked, and 5 feet thick, and carries good copper ore. The lode continues southward and appears to be a little east of the very prominent pinnacle of rocks. Grano-diorite rocks crop out near the present camp in the creek bed, so that it evidently underlies the Heathcotian beds, and the lode may be found in the granite by sinking, for this rock is favorable to the lodes.

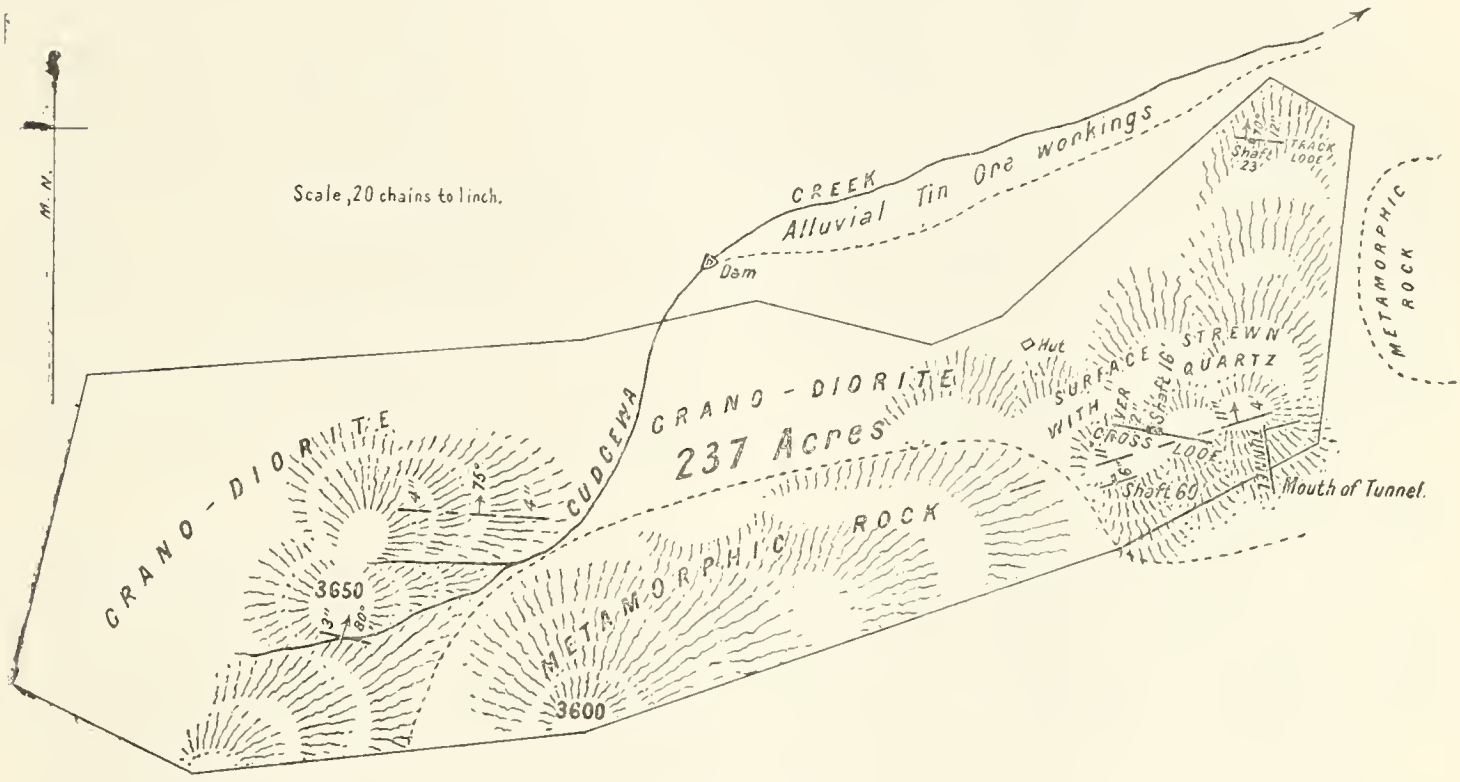


Fig. 16.

Sketch Plan showing Tin Lodes, Mt. Cudgewa.

The copper lode in this locality has a promising aspect and is well worth opening up, especially with copper at over £100 per ton. In testing such lodes as this every effort should be bent towards opening the lode below water-level. Atmospheric action and leaching has gone on to such an extent along the upper portions of the lodes, that there is no possibility of arriving at its original value except by sinking into the lodes below water-level and driving on them. In this case every effort should be made to get a shaft or winze down to test the lode in its original condition. In too many cases the money that should be devoted to testing the lode where it has not been impoverished by surface action is frittered away in shallow surface trenches and pits, and nothing but disappointment results. The indications here fully warrant the expenditure necessary for testing the lode to a depth of 100 feet below the creek level. It is to be expected that many other copper lodes would be found by prospecting the surrounding country. Both the Heathcotian beds and the grano-diorite are favorable to the occurrence of silver-lead and copper lodes. There is a permanent and considerable supply of water in Jingallala Creek at a distance of about 4 miles from the present workings. The transport difficulty is a serious one, but as the country becomes opened up by railways this will be solved, and even now 20 per cent. ore would be profitable to work, and by concentrating the ore could be brought up to this standard if the quantity is sufficient to warrant the erection of plant.

[*Report sent in 16.3.07.*]

THE MONS MEG AND UNITED MINERS' MINES, HARRIETVILLE.

By J. P. L. Kenny.

The Mons Meg Mine, Harrietville.

The Mons Meg mine forms part of a group of workings extending south from Harrietville, between the east and west branches of the Ovens River.

The group includes the Johnson, Lady Jane, Tiddle Dee, New Tiddle Dee, Jackass, Mons Meg, and Guerdon mines. The surface workings on the Guerdon reef are seen on the eastern side of the spur, just above the point where the New Harrietville to Omeo road crosses the old road. The Mons Meg reef outcrops 450 feet west of the Guerdon reef on the western side of the spurs. On the surface the Mons Meg reef has been worked for a length of 160 feet. The strike of the reef is N. 30 deg. W. and its dip is east 52 deg. The shoot has been worked down to the No. 6 Guerdon level, a vertical depth of 550 feet, with highly payable results.

At this level the shoot was 230 feet long and was worked from 5 to 15 feet in width.

The shoot pitches south at 55 deg. A winze was sunk 100 feet below the No. 6 level on the Mons Meg line and a drive north for 100 feet put in. From the end of this drive a rise was put up to the No. 6 level. This rise was within 10 feet of the No. 6 level before payable stone was cut.

At No. 6 level the reef had a well defined hanging wall with solid stone and auriferous leaders running into the footwall country. The stone is said to have pinched out 10 feet below No. 6 level. Bunches of auriferous quartz were seen below No. 6 level. The winze is now full of water and the bottom of the stopes cannot be seen. The reef may have been disturbed by a slide or the stone may have pinched out.

The average value of the stone milled from the Mons Meg reef was 12 dwts. per ton.

Taking into consideration the width and value of the stone where last worked, the Mons Meg is well worth further prospecting at deeper levels. The workings on the Mons Meg reef are not included in the present survey, excepting such as were necessary in the survey of the Guerdon mine.

The Guerdon lode outcrops to the west of a diorite dyke. The reef strikes N. 10 deg. W. and dips E. 67 deg. The upper portion of the Guerdon reef has been worked from 3 adits driven into the eastern side of the spur. Some surface stone is said to have yielded 3 ozs. of gold per ton. No stoping has been done from No. 2 adit. The main dyke here is 25 feet wide and 10 feet east an offshoot 5 feet wide was passed through. At this level the reef was just on the western side of the dyke. The reef in the dyke has not been stoped.

The No. 3 adit was driven by Messrs. Wilson and Hynd and cuts the reef at a depth of 180 feet. A shoot 50 feet long was worked to 70 feet above the level.

About 500 tons were crushed from above the level, averaging 15 dwts. gold per ton. A winze was sunk 25 feet below the level and 30 tons crushed from the winze averaged 15 dwts. of gold per ton.

No. 4 level was driven from the western side of the spur, the Upper Mons Meg adit being continued to cut the Guerdon line.

No stone has been stoped above No. 4 level.

lode is strongly marked, and 5 feet thick, and carries good copper ore. The lode continues southward and appears to be a little east of the very prominent pinnacle of rocks. Grano-diorite rocks crop out near the present camp in the creek bed, so that it evidently underlies the Heathcotian beds, and the lode may be found in the granite by sinking, for this rock is favorable to the lodes.

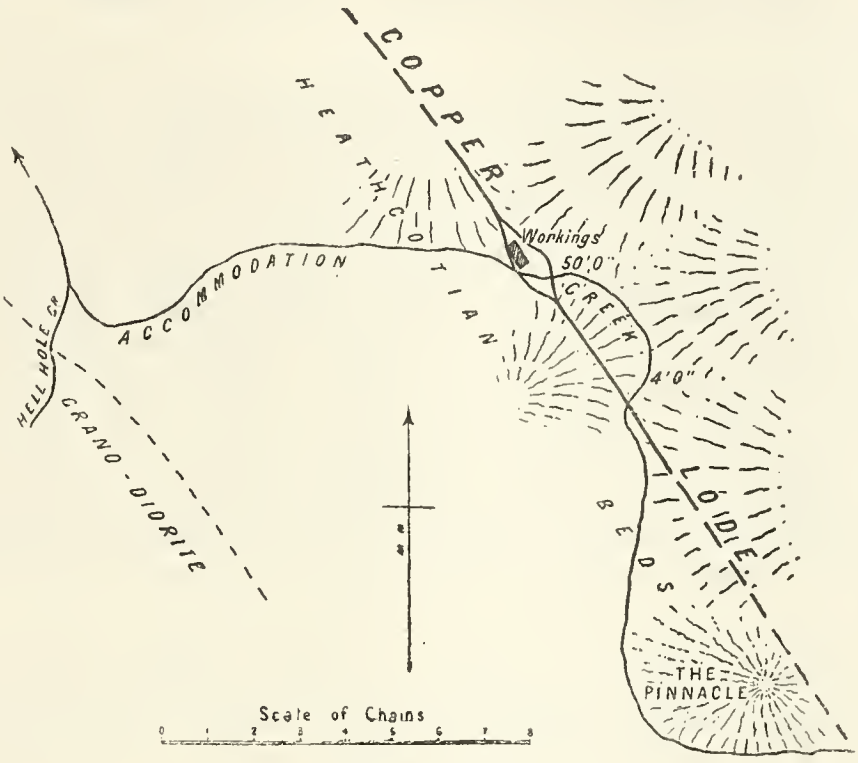


FIG. 13.

Sketch Plan of Copper Lode at Accommodation Creek.

The copper lode in this locality has a promising aspect and is well worth opening up, especially with copper at over £100 per ton. In testing such lodes as this every effort should be bent towards opening the lode below water-level. Atmospheric action and leaching has gone on to such an extent along the upper portions of the lodes, that there is no possibility of arriving at its original value except by sinking into the lodes below water-level and driving on them. In this case every effort should be made to get a shaft or winze down to test the lode in its original condition. In too many cases the money that should be devoted to testing the lode where it has not been impoverished by surface action is frittered away in shallow surface trenches and pits, and nothing but disappointment results. The indications here fully warrant the expenditure necessary for testing the lode to a depth of 100 feet below the creek level. It is to be expected that many other copper lodes would be found by prospecting the surrounding country. Both the Heathcotian beds and the grano-diorite are favorable to the occurrence of silver-lead and copper lodes. There is a permanent and considerable supply of water in Jingallala Creek at a distance of about 4 miles from the present workings. The transport difficulty is a serious one, but as the country becomes opened up by railways this will be solved, and even now 20 per cent. ore would be profitable to work, and by concentrating the ore could be brought up to this standard if the quantity is sufficient to warrant the erection of plant.

[*Report sent in 16.3.07.*]

25 SEP 1912
BRITISH MUSEUM
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TURAL HISTORY

THE MONS MEG AND UNITED MINERS' MINES, HARRIETVILLE.

By J. P. L. Kenny.

The Mons Meg Mine, Harrietville.

The Mons Meg mine forms part of a group of workings extending south from Harrietville, between the east and west branches of the Ovens River.

The group includes the Johnson, Lady Jane, Tiddle Dee, New Tiddle Dee, Jackass, Mons Meg, and Guerdon mines. The surface workings on the Guerdon reef are seen on the eastern side of the spur, just above the point where the new Harrietville to Omeo road crosses the old road. The Mons Meg reef outcrops 450 feet west of the Guerdon reef on the western side of the spurs. On the surface the Mons Meg reef has been worked for a length of 160 feet. The strike of the reef is N. 30 deg. W. and its dip is east 52 deg. The shoot has been worked down to the No. 6 Guerdon level, a vertical depth of 550 feet, with highly payable results.

At this level the shoot was 230 feet long and was worked from 5 to 15 feet in width.

The shoot pitches south at 55 deg. A winze was sunk 100 feet below the No. 6 level on the Mons Meg line and a drive north for 100 feet put in. From the end of this drive a rise was put up to the No. 6 level. This rise was within 10 feet of the No. 6 level before payable stone was cut.

At No. 6 level the reef had a well defined hanging wall with solid stone and auriferous leaders running into the footwall country. The stone is said to have pinched out 10 feet below No. 6 level. Bunches of auriferous quartz were seen below No. 6 level. The winze is now full of water and the bottom of the stopes cannot be seen. The reef may have been disturbed by a slide or the stone may have pinched out.

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The No. 3 adit was driven by Messrs. Wilson and Hynd and cuts the reef at a depth of 180 feet. A shoot 50 feet long was worked to 70 feet above the level.

About 500 tons were crushed from above the level, averaging 15 dwts. gold per ton. A winze was sunk 25 feet below the level and 30 tons crushed from the winze averaged 15 dwts. of gold per ton.

No. 4 level was driven from the western side of the spur, the Upper Mons Meg adit being continued to cut the Guerdon line.

No stone has been stoped above No. 4 level.

A rise was put up 145 feet, but levels 3 and 4 were not connected Payable stone was left in the stopes below No. 3 level. The reef below these stopes should be further prospected as the shoot may go down south of the rise from No. 4 level. This prospecting could best be carried out by making a connexion between the winze from No. 3 and the rise from No. 4 level.

No. 5 level is the continuation of the lower Mons Meg adit. It cuts the Guerdon line at a depth of 500 feet. A shoot about 90 feet long has been worked between levels 4 and 5. This shoot was worked by the New Options Company. The stone was crushed with stone from other mines and records of the gold won are not obtainable.

A winze was sunk below the No. 5 level but no stoping was done. In order to work the Guerdon reef below the No. 5 level a crosscut is now being put out east from the bottom Mons Meg adit. This adit is 280 ft. 6 in. below the Lower Mons Meg level. It is driven from a gully 1,500 feet north of the Mons Meg reef. The adit was put in to work the New Tiddle Dee reef; the drive south is on this reef for a distance of 300 feet where the reef is cut off by a crosscourse. There are extensive workings to the north at this level. These workings were not examined, but from an inspection of the mine plans it seems probable that the crosscourse has cut off a shoot on the old Tiddle Dee lode further east. If this is the case the shoot could be picked up again on the south side of the crosscourse. The drive extends south a total distance of 1,903 feet. The Mons Meg reef has been stoped from the surface to 10 feet below this level as described above.

In order to cut the Guerdon shoot worked between levels 4 and 5, a crosscut east is now being driven from a point 430 feet north from the face of the drive. If this crosscut is driven with a bearing E. 32 deg. N. it will cut the reef at about 415 feet, 260 feet below No. 5 level, giving 280 feet of backs on the underlay of the reef.

The shoot appears to be pitching north. If the reef is not payable when cut, driving north on the line is advisable.

The plans and sections of this mine will be published later.

[*Report sent in 16.9.07.*]

The United Miners' Mine, Harrietville.

The United Miners' reef was one of the earliest worked in the Harrietville district; it is situated on the spur between the east and west branches of the Ovens River, 2½ miles south of Harrietville.

The outcrop of the reef crossing the Harrietville-Omeo road can be traced on the surface for a distance of 500 feet. The strike of the reef is N. 42 deg. W., and the dip 80 deg. E. To the south, the reef intersects a diorite dyke running nearly north and south and dipping to the west.

The reef cuts through the dyke and runs a few feet into the country to the south. Two shoots have been worked to the surface on this reef, one 90 feet long, just to the north of the dyke, and the second 25 feet long, 250 feet further north. This shoot has been worked for a length of about 300 feet at the No. 2 level.

To the west of the main reef another reef, known as the "West reef," branches off and diverges, going north. This reef averages 3 feet wide, and dips 85 deg. E.

A shaft was sunk on the main reef from the Harrietville-Omeo road, and five adits have been driven, the lowest being 400 feet below the mouth of the shaft.

No. 1 level is driven on the line of the West reef; a shoot of stone 30 feet long and 3 feet wide has been worked on this reef to a depth of 45 feet.

The No. 2 level was put in after the company which worked the mine had ceased operations. A block of payable stone was supposed to have been left in the old workings, and this level was driven to locate it, but the undertaking was not successful.

The United Miners' reef was cut at 75 feet from the adit mouth in solid ground. The adit was continued west, and intersected the West reef. A drive north for 60 feet was put in on this reef, and a rise was put up to the shoot worked in the No. 1 level. The drive was continued, and another reef, 1 foot wide, was cut 15 feet further west. This reef was driven on for a distance of 100 feet, and some of the quartz was probably crushed, as there is a pass at the north end of the drive. From this reef, a drive was put in back to the United Miners' line. The reef was cut 235 feet north of the point where the line was intersected in the cross-cut, and just south of a rise to the surface. The reef had been stoped out at this point, and also at another point 60 feet further south, where the line was again cut.

In the No. 3 level, the United Miner's reef is cut at 227 feet from the adit mouth, and 5 feet further west the dyke is intersected. The adit is blocked at this point, and the width of the dyke could not be ascertained. This adit continues west for 180 feet. Its position has been laid down from a plan by Mr. T. C. Davey. At this level the reef has been worked to the south of the dyke.

At the No. 4 level a cross-cut west has been put in for 541 feet, passing through the dyke which is 24 feet thick; 60 feet east of the dyke a reef 4 feet to 6 feet wide was cut. A drive south follows the reef for 90 feet, and a cross-cut to the west cuts the dyke, which is here 14 feet wide, at 35 feet. The reef to the east of the dyke carries a little gold, and if the drive on it were continued south for about 100 feet, the reef would junction with the dyke and might become payable near the junction. To the north of the cross-cut a drive is open for a distance of 328 feet. It cuts the dyke, which widens out towards the north. The reef has been stoped for a length of 70 feet in the dyke. At 328 feet from the cross-cut the drive is blocked, passing into the second shoot, said to be about 200 feet long.

The No. 5 level is accessible for a distance of 1,057 feet. At 838 feet a cross-cut south-west is open for a distance of 116 feet. This cross-cut was driven a further distance of 262 feet and must pass through the dyke. At 1,057 feet in the adit there is a drive 92 feet south to the east wall of the dyke and a rise to No. 4 level. Mr. Davey's plan shows the cross-cut for 155 feet beyond this drive, a drive north for 140 feet, and a rise at the north end of the drive.

The main shoot on the United Miners' reef, which was worked from the surface to below the No. 4 level, has not been located in the No. 5 level. The dyke in this level is further west than would be expected from its

position in the upper levels, and it is probable that the reef and dyke have been faulted between No. 4 and No. 5 levels. By cleaning out the drive north at the No. 5 level a rise could be put up on the west wall of the dyke. Such a rise would probably intersect the United Miners' reef, and this is the best method of prospecting the mine.

The country rock to the east of the United Miners' reef dips to the west. The reef outcrops near the top of the spur between the two branches of the Ovens River; on the western side of this spur the country rock dips east, so that the top of the spur with the reef and dyke occupies the centre of a large syncline. The country in the vicinity of the dyke and reef is very soft, and carries a large amount of water. The dyke is everywhere decomposed to a soft reddish earth. The width of reef stoped and the precise boundaries of the shoots cannot be ascertained, the old workings in the reef being almost all inaccessible. The recorded yields from the United Miners' reef from 1869 to 1875 are given below. During this time 27,105 tons of quartz were crushed for 11,899 ounces of gold, an average of 8 dwts. 18 grs. per ton. The mine was worked prior to 1869, but the table does not include the earlier crushings from the reef—

Date of Report.	Tons.	Yield. oz. dwt. gr.	Depth in feet.
31.12.69 ...	780 ...	919 11 12 ...	250
31.3.70 ...	1,690 ...	740 0 0 ...	250
30.6.70 ...	1,800 ...	600 0 0 ...	240
30.9.70 ...	1,800 ...	744 17 0 ...	250
31.12.70 ...	1,500 ...	520 0 0 ...	230
31.3.71 ...	1,200 ...	433 0 0 ...	280
30.6.71 ...	1,500 ...	560 0 0 ...	260
30.9.71 ...	1,500 ...	800 0 0 ...	288
31.12.71 ...	1,240 ...	1,437 15 0 ...	230
31.3.72 ...	1,200 ...	600 0 0 ...	230
30.6.72 ...	25 ...	15 6 0 ...	40
30.9.72 ...	1,600 ...	400 0 0 ...	200-300
31.12.72 ...	1,200 ...	510 0 0 ...	350
31.3.73 ...	1,600 ...	650 0 0 ...	300
30.6.73 ...	800 ...	200 0 0 ...	300
30.9.73 ...	1,200 ...	420 0 0 ...	300
31.12.73 ...	2,400 ...	300 0 0 ...	400
31.3.74 ...	1,500 ...	270 0 0 ...	300
30.6.74 ...	1,500 ...	1,312 0 0 ...	350
30.9.74 ...	1,000 ...	320 0 0 ...	200-240
31.12.75 ...	70 ...	47 10 0 ...	350

The plan and sections of this mine will be published later.

[Report sent in 10.5.07.]

THE SCOTCHMAN MINE, BRIGHT, AND THE LONDON REEF, BUFFALO.

By J. P. L. Kenny.

The Scotchman Mine, Robert's Creek, Bright.

The Scotchman mine lies about 5 miles to the east of Bright on the spur between Robert's Creek, a tributary of the Ovens, and the head waters of the Kiewa River. This reef, with other workings to the north, marks a separate belt of auriferous country east of the main belt extending from Harrietville to Bright. About a mile south of the Scotchman, at the Queen of the Hills' workings, good stone is being obtained from a reef which is probably on the same line.

At the Scotchman workings the reef on the surface is about a foot wide; strike W. 37 deg. N., dip 69 deg. E. A shaft has been sunk on the reef to a depth of 55 feet. At 18 feet in the shaft the reef was cut off by a vertical fault. The shaft was continued and the reef picked up again, the throw of the fault being 15 feet. The stone obtained in sinking the shaft is said to be payable, but the work done is not sufficient to determine the length of the shoot, and up to the present there has not been a trial crushing. About 200 feet north-west of the shaft an adit has been put in to cut the reef at a depth of 53 feet below the bottom of the shaft. At 20 feet from the mouth, the adit cut the fault showing in the shaft. Beyond the fault line 15 feet of spurry country carrying a little gold was passed through. At 95 feet the adit cut the Scotchman line, the reef being 5 feet wide. From this point a drive should have been put in south along the line. The adit was continued for 110 feet beyond the reef, and then a drive south cut the reef again 35 feet south-west of the shaft. The reef here carries a little gold, and can now be tested by driving both ways from the adit level. The shoot of stone worked in the shaft will probably be found north of the point where the drive cuts the reef. The enclosing country rock consists of thin bedded slate and sandstone dipping west. The strike of the reef is the same as that of the enclosing beds, but as it dips east it cuts across them.

[*Report sent in 11.6.07.*]

London Reef, Keating's Creek, Buffalo.

The London reef lies to the west of the Buckland River in the basin of Keating's Creek, 3 miles south-west of Porepunkah, and about a mile east of the Buffalo granite. Three reef-outcrops show on the surface, and the middle reef has been worked with payable results. Surface adits have been put in on the two other outcrops and no gold obtained. The strike of the middle reef is W. 37 deg. N., dip 75 deg. E. The country rock dips W. 65 deg., so that the reef cuts across the strata. A shaft has been sunk to a depth of 65 feet on the underlay. The shoot of stone is 30 feet long on the surface, and is cut off by a north and south fault dipping W. 50 deg. This fault can be seen in the shaft at a depth of 40 feet; below this point no gold has been obtained.

The shaft is sunk on the reef below the fault, and from the bottom of the shaft a drive south has been put in 42 feet without picking up the shoot. A rise from the south end of the drive at the bottom of the shaft would test the reef below the shoot which has been worked.

The London reef was discovered and worked by Mr. John Butler about 30 years ago. Rich stone was obtained from the shoot worked; about 90 tons of stone were crushed for yields ranging from 3 to 5 oz. per ton.

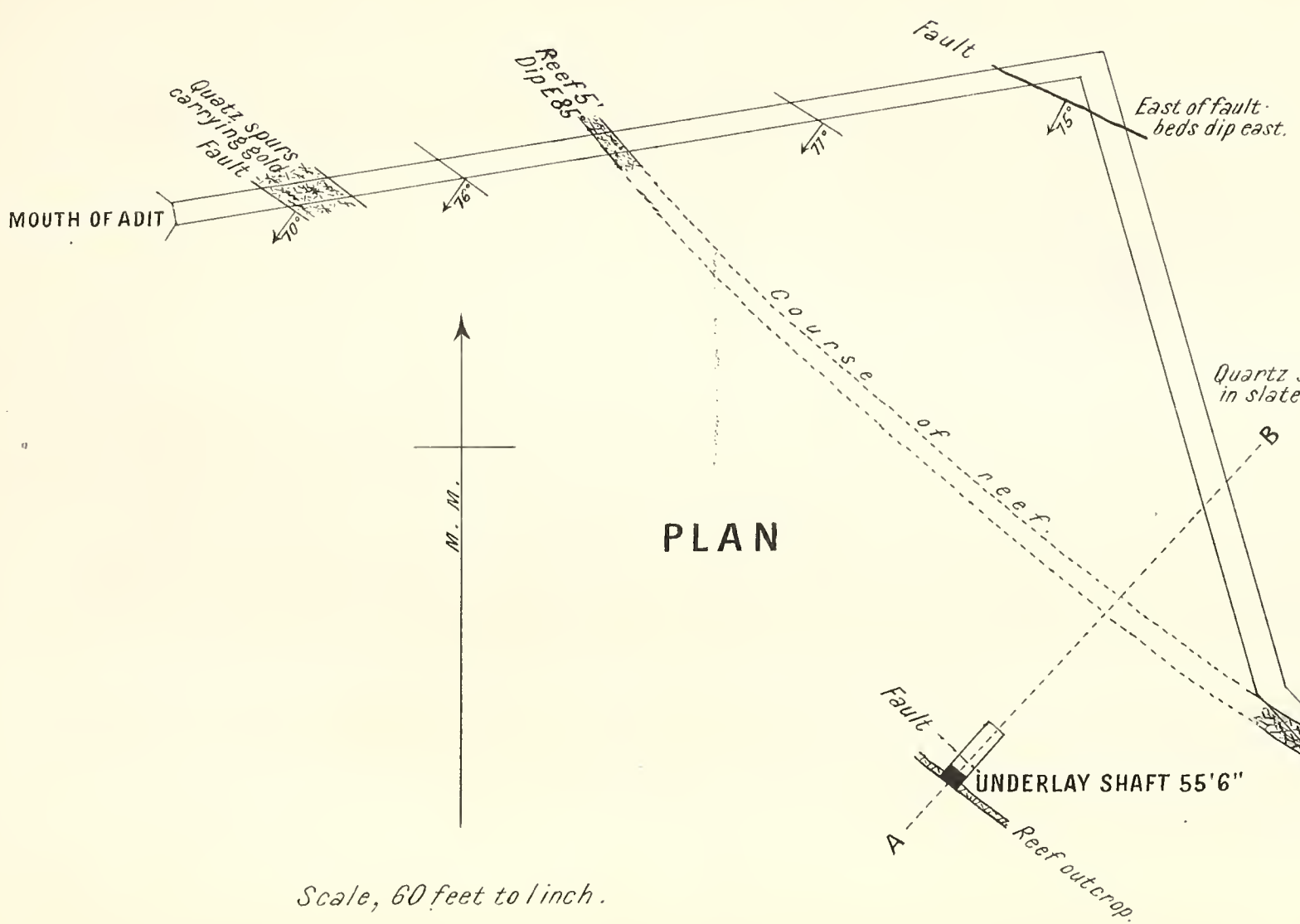
[*Report sent in 27.5.07.*]

PLAN AND SECTION OF
THE SCOTCHMAN MINE
ROBERT'S CREEK, BRIGHT.

REFERENCE

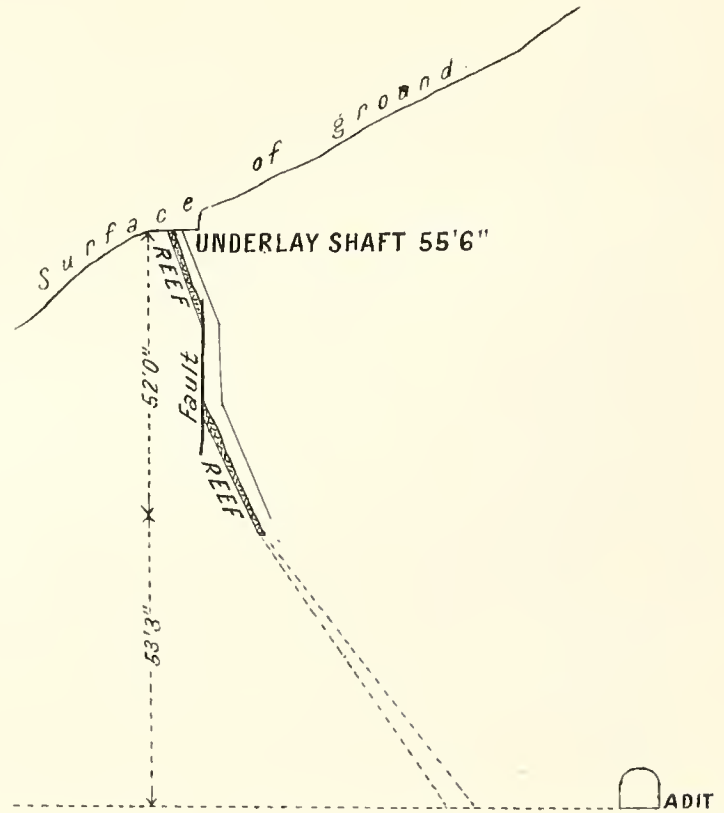
Strike and dip of strata 76°

Quartz



PLAN

Scale, 60 feet to 1 inch.



TRANSVERSE SECTION A.B.

Geological Survey of Victoria, Records, Vol. 3, Part 1.

Plate IX

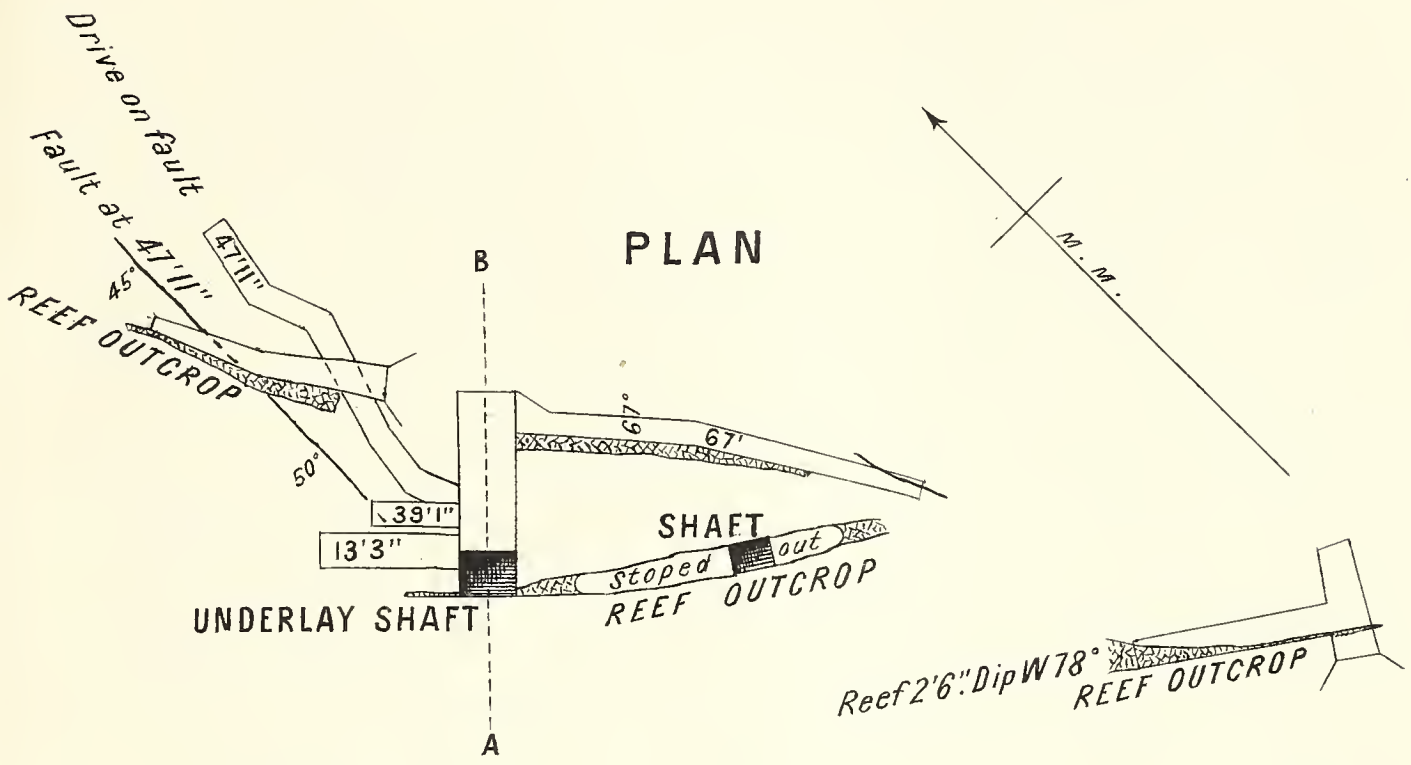
BRITISH MUSEUM (NATURAL HISTORY)

PLAN AND SECTIONS OF

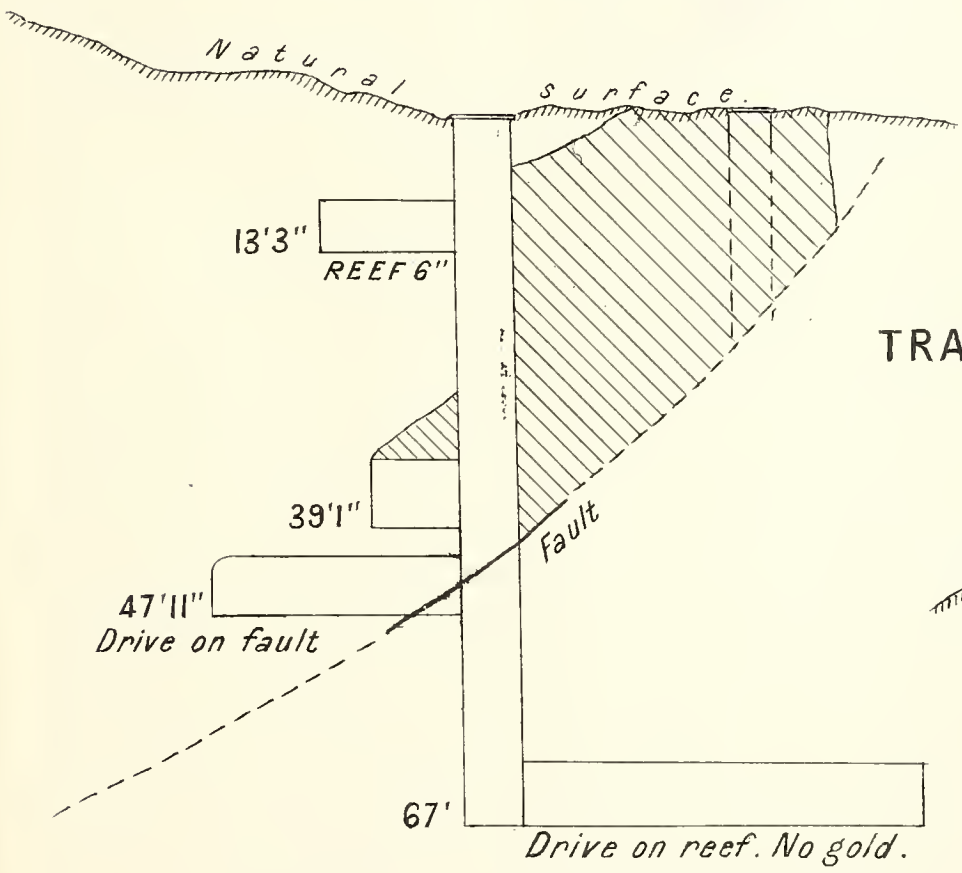
THE LONDON MINE

KEATING'S CREEK, BUFFALO.

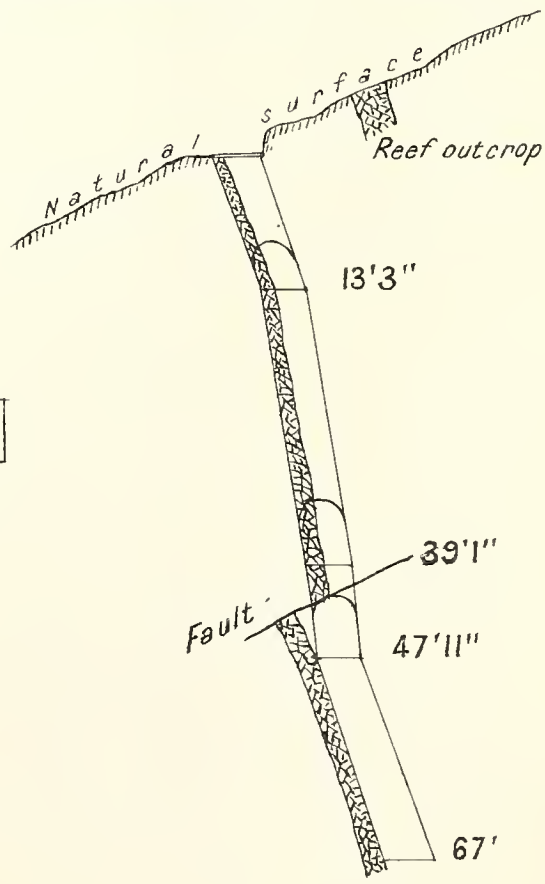
Scale, 30 feet to 1 inch.



LONGITUDINAL SECTION



TRANSVERSE SECTION A.B.



REFERENCE

Quartz,

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BRITISH MUSEUM
NATURAL HISTORY

THE BRITISH AND AUSTRALIAN GOLD MINING COMPANY, STONY CREEK.

By John Easton.

The British and Australian.

This company's property is situated on Stony Creek, a small branch of Sandy Creek, which is a tributary of the Mitta Mitta River, and is about 12 miles distant from Huon Lane, the nearest railway station, and has a good main road to within about 2 miles of the workings.

The locality is within the large area of metamorphic rocks which exist in the north-eastern portion of Victoria, and this company's workings are confined to pegmatite dykes intruded into a mass of granite rocks. The dykes are very little removed in lithological character from the surrounding granite, and are somewhat perplexing to any one unfamiliar with such occurrences. The chief distinguishing features of the pegmatite are the absence of mica and the abundance of metallic minerals, chiefly arsenical pyrites, disseminated throughout.

Three of these dyke formations have been worked to a more or less degree within this lease; they are known as the Grasshopper, the Honeysuckle, and the Happy Day or Scheimaster's lines, and are shown on the accompanying surface plan.

The Grasshopper dyke has been the chief line of workings. It strikes a few degrees to the east of north on the surface and gradually trends more easterly in depth, with an average dip of about 65 deg. E. The lode is very irregular in width, varying from as much as 8 or 10 feet in the surface stopes down to about 4 feet in the lower portions of the workings, with an average width of a little over 4 feet.

This lode has been worked up to the present time by means of two adit levels and an underlay shaft, and the lower portions by means of an additional winze some distance to the south of the shaft. Haulage has been done by a whip with pulleys to guide the rope around the various angles in its ascent from the winze to the shaft.

The present company when they secured the property undertook the sinking of a new vertical shaft, and have devoted almost the whole of their capital and energy to this purpose. The shaft is now 160 feet deep, and still has to be sunk about 70 feet before it gets below the old workings. The sinking is very hard, and Mr. Sheppard, the manager, informed me that the last 60 feet or so cost him about £5 per foot. Any further sinking will in all probability cost at the same rate. It is desirable that this shaft should be continued as it is in a good position to command the future working of the auriferous shoot and would intersect the lode somewhere about the bottom of the present workings as near as I could judge from my compass survey.

The auriferous shoot pitches to the south at an angle of about 66 deg., and appears to pinch and make in length. It averaged about 50 feet in length and a little over 4 feet in width. I have taken the following information concerning the history of the mine and the gold yields from a report by Mr. Peter Wright, which the manager informs me is the most reliable record obtainable:—According to this report, the original discoverers of the Grasshopper lode, Messrs. Conness and Gibson, crushed 350 tons for 871 oz. of gold, and then as the lode became poor they abandoned it. It was again taken up by Messrs. Gathergood and Nankervis, who opened out northward and found the northern portion of the shoot shown in accompanying longitudinal section. From it they obtained 150 tons of ore which

yielded 285 ozs. of gold. The claim was again abandoned owing to another patch of poor ground being met with. After some time Briddon and Son went into the ground abandoned by Conness and party and broke out 20 tons of stone which they crushed together with 30 tons of rubble discarded by their predecessors, and from the whole obtained 20 ozs of gold. Sinking through this poor stone they found improved ore and crushed 835 tons for 1,150½ ozs. of gold. Up to the time of Mr. Wright's report (20.12.05) this party had crushed 885 tons for 1,170½ ozs., giving an average of 1 oz. 6 dwts. 11 grs. of gold per ton, and the total quantity crushed from the whole mine was 1,385 tons for 2,326½ ozs. of gold, giving an average of 1 oz. 13 dwts. 14 grs. of gold per ton. The whole of this was free gold. Twenty tons of pyrites was saved from the last crushing (84 tons for 120 oz. 15 dwts. free gold). When treated by the mill-owner this yielded 12 ozs. of gold or 12 dwts. per ton, making a total of 1 oz. 11 dwts. 15½ grs. per ton. Further crushings were obtained, but I was not able to obtain details.

The last crushing from the bottom of the winze obtained prior to the present company taking possession is said to have yielded 25 dwt. of gold per ton (10 tons).

The whole of the lode formation is heavily charged with sulphide which appears to have been an almost neglected source of revenue owing to the present company's concentrating table proving a failure. Properly treated it should add considerably to the value of the mine.

Mr. Sheppard showed me the prospects obtained from a small quantity of the mineral which he had burnt in his fireplace, and the results after panning off in a dish were exceedingly good.

I also tried several samples of the lode from the bottom of the present workings and obtained fair prospects of free gold in several instances and always a very large percentage of mineral. In one case I observed free gold in the solid matrix of quartz and felspar.

There is every indication of the auriferous shoot continuing to unknown depths, as the gold appears to have been deposited simultaneously with the dyke formation. In the lowest workings the lode has a well-defined footwall, but the hanging wall is very irregular. The formation, which is from 4 to 5 feet wide, appears to be nearer the vertical and is very heavily charged with mineral.

The Honeysuckle Shaft.

About 14 chains to the south-east of the Grasshopper new shaft is the Honeysuckle shaft which is now flooded. The manager informs me that it is 190 feet deep, with a winze somewhat to the north down another 49 feet. The lode was 18 feet wide on the surface, and averaged about 7 feet down the shaft, of which 2 feet of the hanging wall was left. Most of the stoping was to the north of the shaft and the shoot was vertical to a little northerly. The strike of the hanging wall is about N. 7 deg. W. and the dip 78 deg. W. The present company crushed 10 tons from the south end of surface workings for about 8 dwts. per ton. Mr. Martin, from whom the present company bought, crushed a considerable quantity of ore from this line, and is said to have obtained as much as 2 ozs. per ton.

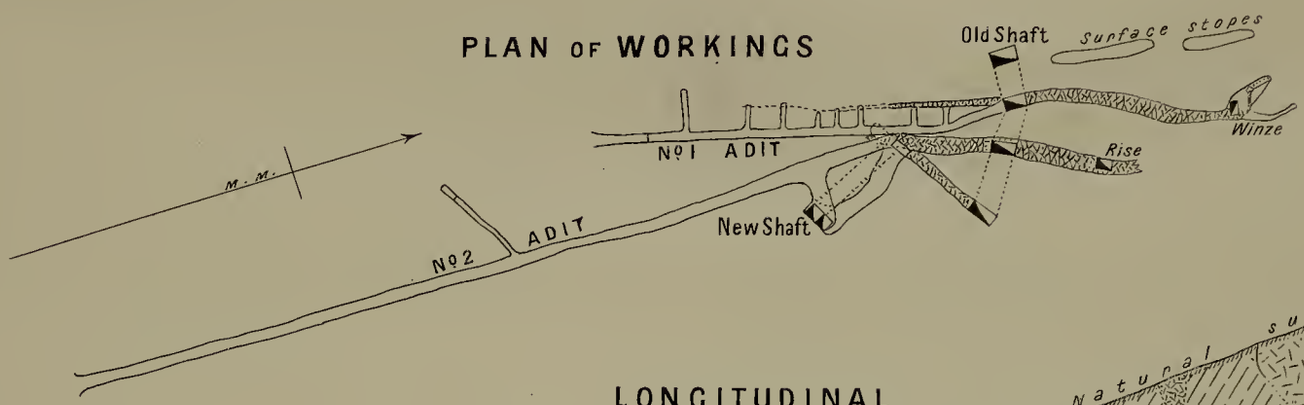
The Happy Day or Scheimaster's Dyke.

The Happy Day lode lies to the south-west of the Grasshopper line and is probably its continuation. It was first discovered by a prospector named Scheimaster who worked the alluvial gold in the loam on the hill-

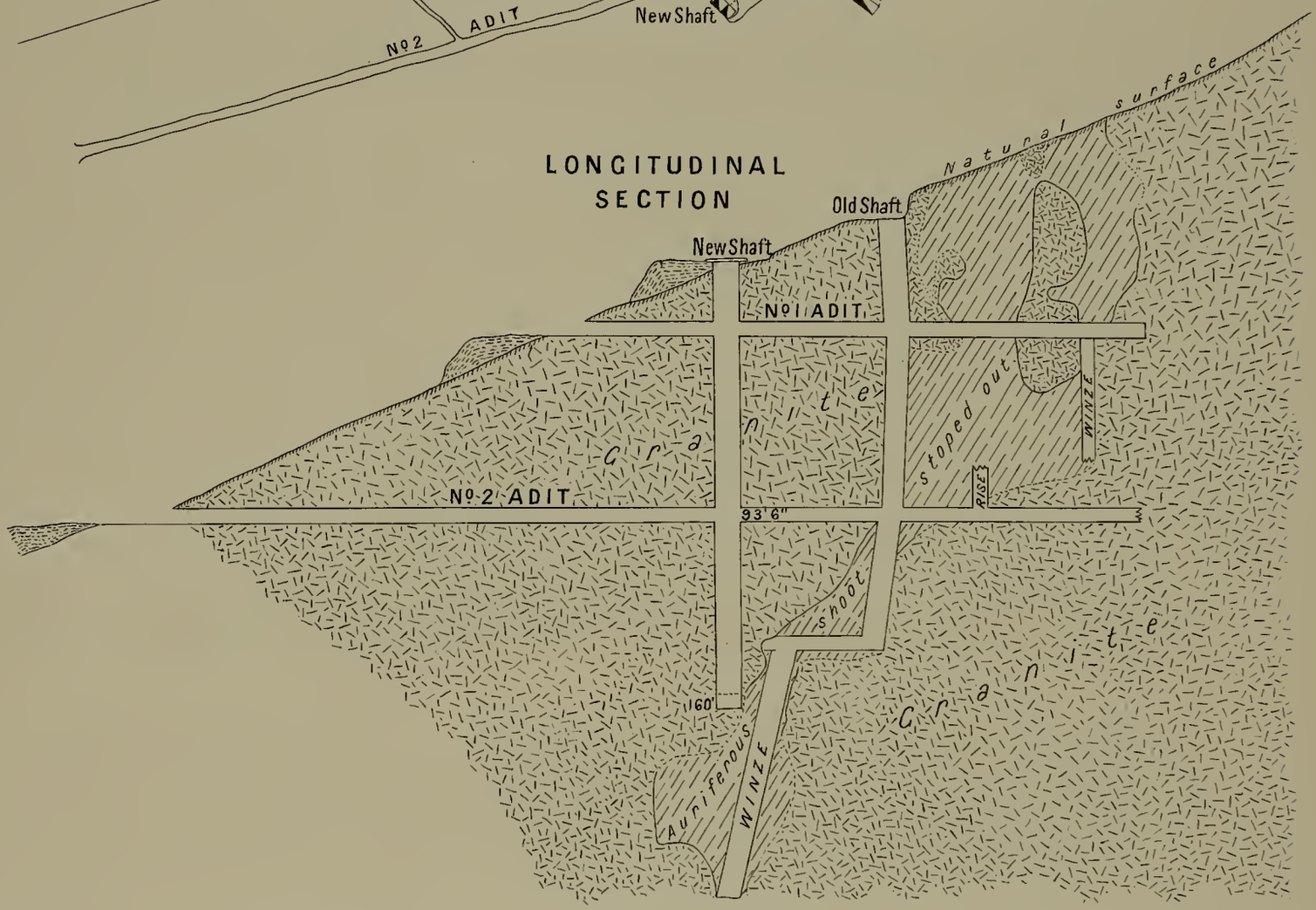
PLANS AND SECTIONS OF BRITISH AND AUSTRALIAN G. M. Co SANDY CREEK

Scale, 60 feet to 1 inch.

PLAN OF WORKINGS



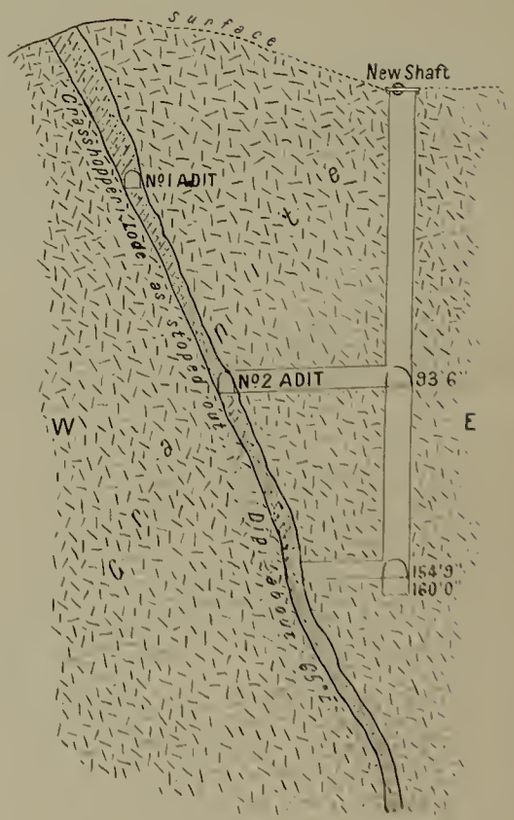
LONGITUDINAL SECTION



SURFACE PLAN

Scale, 4 chains to 1 inch.

TRANSVERSE SECTION



BRITISH MUSEUM
NATURAL HISTORY

side with, I believe, fair results. After washing off the alluvial he found the dyke beneath, and according to Mr. Wright's report obtained a crushing which yielded 12 dwts. of gold per ton. Further crushings, however, gave very little over 6 dwts. per ton, and this was considered unpayable so the ground was abandoned. The report also states that a sample of stone dollyed from this lode gave concentrated pyrites equal to $4\frac{1}{2}$ per cent. of stone crushed, and on assay the concentrates yielded at the rate of $12\frac{1}{2}$ ozs. per ton. At the north end of the loam workings shown on plan the Happy Day lode was opened out on the surface for about 10 feet wide and 15 feet deep, and from this quarry Mr. Sheppard recently milled 5 tons which yielded about 3 dwts. of gold per ton. He also crushed 3 tons of mullock from the extreme south end of this line of workings near the mouth of an old fallen-in adit, and this gave 7 dwts. of gold per ton. At this latter point the lode is up 35 feet in width. There are numerous other workings to the south of this property and all are on similar formations.

[*Report sent in 25.6.07.*]

SOME MINES AT BONEGILLA AND BETHANGA, NORTH-EASTERN DISTRICT.

By E. J. Dunn, F.G.S., Director, Geological Survey.

Bonegilla.

The Bonegilla Gold Mining Company's workings, No. 1 locality, is on the west portion of allotment 11A, section IX., parish of Bonegilla, on the side of a hill which rises about 90 feet above the alluvial flats. It is opposite to and over half-a-mile in a south-westerly direction from the junction of the Murray and Mitta Mitta Rivers.

The country rock belongs to the highly metamorphic series which is so well developed at Bethanga and which continues from Bonegilla through the ranges of hills past Rat's Castle and on to Indigo Creek, which appears to be its western boundary. This metamorphic series consists of schists and gneissose rocks which appear to be much older than the schists resulting from the local alteration of Ordovician rocks. They are of great economic importance as valuable mineral lodes are found to occur in them, such as those at Bethanga, and it appears highly probable from the manner in which the surface of the mineralized portions give little or no evidence of the presence of valuable ores below, that more careful prospecting may result in unearthing much treasure not at present suspected to exist in these rocks. The remarkable discovery at Kookimburra is a case in point, illustrating how little surface evidence exists of deposits of complex sulphide ores below.

The rock at Bonegilla is gneissose and very micaceous. At No. 1 locality, in the side of the hill, a cutting exposes ferruginous quartz veins from 1 to 6 inches thick, which cut through the country. They strike north and south and dip to the west at an angle of 32 deg. These veins are said to assay a few dwts. of gold per ton, and by loaming colours of gold are said to be obtainable anywhere over the surface.

No. 2 locality is about 3 chains north-west of No. 1 and is further up the slope. The excavation is about 20 feet deep, and it exposes a wall dipping in a south-easterly direction. There are numerous quartz veins of very ferruginous character traversing the broken and shattered country rock. Small ferruginous veins are numerous also, and here gold to about the same value per ton as at No. 1 locality is said to have been obtained.

No. 3 locality is on the top of the ridge and a few chains from No. 2 locality; here a shaft has been sunk 20 feet. The country rock is very micaceous and similar quartz veins intersect it; the largest is about 6 inches thick. The quartz is reputed to have yielded a few dwts. of gold per ton.

No. 4 locality is about 20 chains west of No. 3. A shaft has been sunk to a depth of 50 feet, and the material on the dump is similar to that shown at the other localities; the country rock and the quartz veins are of the same character as previously described. It appears as though the whole of the belt of country is much crushed and penetrated by irregular ferruginous veins carrying gold, but exact particulars as to the value of gold per ton of the ore were not obtainable. It is reported that from No. 4 locality a crushing yielded 19 dwts. of gold per ton. Judging from the work done it would be concluded that there must have been some encouraging results, otherwise it would not have been persevered with. It does not look as though well defined reefs are to be expected at this locality, but the conditions are such that an extremely low yield of gold would pay if the country and veins could be broken down in a face and all put through the plant; unless this could be done there does not seem to be much chance of profitably working such an occurrence.

There is an unlimited supply of water within about half-a-mile, excellent facilities for working the ground to a depth of, say, 90 feet by means of tunnels, abundance of timber for mining purposes and for fuel, and a railway station (Bonegilla) within 2 miles, so that, with a very low yield and working in a face, profit might be made.

Before, however, the average yield of this belt can be gauged, a certain amount of prospecting work should be done, and to test the value of the high ground no better plan could be adopted than that of driving a tunnel directly below No. 2 locality, a few feet above the flat and in a westerly direction for 200 or 300 feet. This should not be a costly matter and would be best done by contract. Such a tunnel (crosscut) would enable a good idea to be formed of the value of the oxidised veins, but would give no proper guide as to the value of the sulphide ores that undoubtedly occur with the quartz veins below water-level. Sinking below water-level alone will settle this point.

[*Report sent in 17.5.07.*]

The Bethanga District.

The country rock at Bethanga consists of metamorphic schist and gneiss. These rocks differ in character from those occurring as aureoles surrounding granite masses and they may be classed as Archaean.* There is a considerable area of them forming the belt which extends for several miles to the east of Bethanga and westward as far as Indigo Creek. Northward of Yackandandah, these rocks consist of highly contorted, very micaceous schists. Their proper boundaries have not yet been determined to the south, but they extend northward to the Murray River. There is a wide area of similar rocks at Benambra.

* See Professor Gregory, F.R.S., D. Sc., Proc. Roy. Soc. Vict., 1903.

The lodes at Bethanga that intersect these Archaean rocks are very persistent; some of them have been traced for some miles. Their strike is from N. 25 deg. E. to N. 32 deg. E. There are several lodes known and probably many yet to be discovered. The most westerly lode is the Currajong lode on which the Mt. Corryjong Company is working. It is said to be traceable to the northward to the river flats of the Murray and southward to the flats of the Mitta Mitta River, a length of 6 or 7 miles; the next is the Hamburg lode about half-a-mile from the Currajong lode, said to be traceable for 2 miles and opened up for some little distance by a tunnel. About 25 chains further east is the Gift lode or main line which has been worked for about 3 miles of its length. Still further east, about 30 chains from the Gift lode, is the Welcome lode, said to be traceable for 2 miles. There are probably others that have not yet been discovered still further east.

In these lodes are sulphides of iron, copper, lead, zinc, and arsenic, together with some gold and silver. At the surface the lodes were first worked for copper and smelters were used for the oxidized ores. As depth was attained the sulphides were the only ores and being of a complex character great difficulty has been experienced in treating them. Many processes have been tried without success, most of them wet ones or modifications of them, with the result that work came to a standstill after about 30 years of effort.

The manager of the New Bethanga Company considers that the correct method of dealing with the ores is to smelt them and further that, as the values of such by-products as copper, arsenic, &c., have greatly increased, these also should be saved and marketed. To this end new furnaces are being built and the works are being modified to suit the new methods.

Both the Gift and the Welcome lodes have been extensively opened up, and given a suitable process there is abundance of ore to be won and the lodes are of such a nature that they may be expected to continue persistently downward. It is also quite probable that lower down the value per fathom may increase, for most of the work hitherto done has been above water-level, and, therefore, the ore has been leached and in other ways modified. Mr. Bayne, the manager of the New Bethanga Company states that a great number of assays taken from every available portion of the mine give an average value of over £4 per ton of crude ore.

The deepest shaft on the mine is Martin's shaft which is 820 feet deep and cuts the lode at about 200 feet below the tunnel level. From Martin's shaft the lode has been worked for 1,000 feet southward and has been stoped down to the bottom of the shaft; it has also been stoped northward down to the bottom of the shaft on the Gift lode. The strike of this lode is N. 25 deg. E., dip 80 deg. N.W.

The Gift lode has been faulted in the gully which runs up from the upper township, and a new shaft is being sunk on the south-west side of the fault.

The northern extension of the Gift lode has been tunnelled for a length of 1,378 feet and worked down to a depth of 90 feet by means of a shaft below tunnel-level. At the fault the north end of the Gift lode is thrown westward about 4 chains.

Extensive flat dykes of fine grained granite with much black tourmaline intersect the country and are well seen on the hill south of the Gift shaft. The schists are contorted in a marvellous manner and they shade by insensible gradations into gneiss. The gneiss being sunk through at the new Gift shaft contains in some parts abundance of garnet.

The new Gift shaft is 235 feet deep, the plat is 220 feet from the surface. The lode is 4 feet thick and 7 feet to the west of the shaft at the plat.

Mt. Corryjong Copper Company.

This company is working the Currajong lode at a place about 2½ miles north from the Upper Township, Bethanga. The strike of the lode is N. 25 deg. E., dip 78 deg. E. On the top of a spur a shaft is sunk 98 feet deep. At 78 feet from the surface a rich block of copper ore was obtained. It was about 17 feet long, 10 feet high, and about 2 feet wide on an average. Mr. Grant, the manager, informs me that from this block, copper ore to the value of £530 was obtained. It consisted of black oxide and some sulphide, &c., and contained gold to the extent of 2 dwt. 12 gr. per ton. The copper ore assayed 27 per cent. copper. At 26 feet south of the shaft another slice of ore appears to be showing, as good ore 3 inches thick exists. The shoots pitch south at about 78 deg. At the surface this lode was worked twenty years ago for the gold contained in the gossan. At a lower level 145 feet below the sill of the shaft, a level had been driven in 400 feet; at 430 feet it will be directly under the shaft; the lode has been followed the whole distance.

At 285 feet below this level another tunnel is being driven along the lode; it is only started; this will command 430 feet of "backs." These lodes should maintain a large mining population and if the New Bethanga Company succeeds there will be extensive developments at Bethanga and in its neighbourhood. In case of an expansion in mining a grave difficulty will be the scarcity of timber and fuel.

At one time the whole country around was covered with valuable timber, but these forests have been so devastated that only remnants now survive. Very stringent steps should be taken to prevent the destruction of the timber on grazing areas and on other Crown lands where it can be saved, as the dearth of fuel and mining timber will probably prove a serious handicap to mining expansion in this district.

[*Report sent in 25.5.07.*]

TIN ORE AT KOETONG AND CUDGEWA.

By E. J. Dunn, F.G.S., Director, Geological Survey.

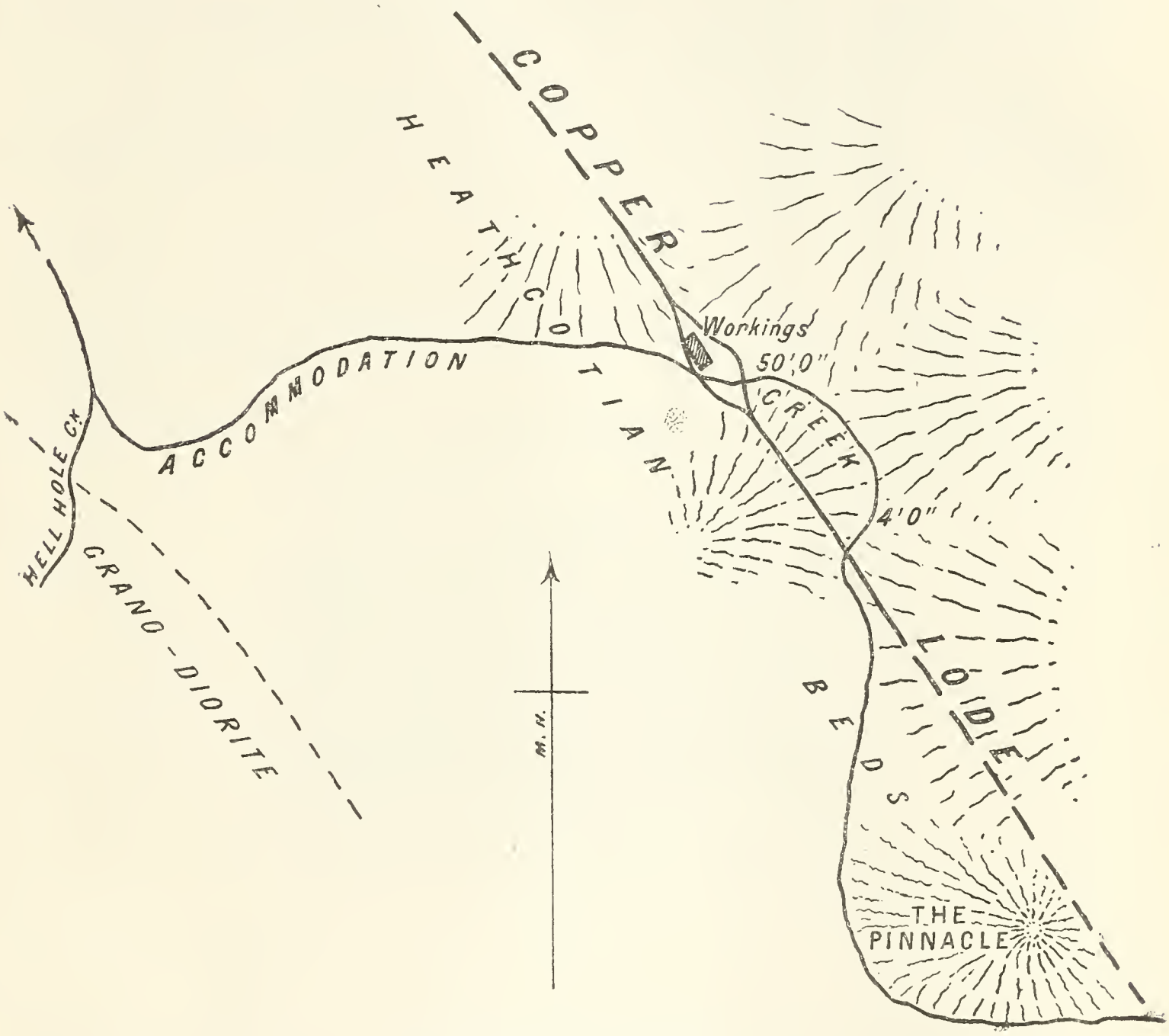
Koetong is about 1,800 feet above sea-level and the country rock around is granitic. The Koetong Creek which crosses the main road here has been worked for alluvial tin ore at a former period for many miles in a northerly direction or down stream.

The Excelsior Tin Mining Company.

The lease worked by this company is situated on the upper portion of Koetong Creek, here called Running Creek, about 2 miles southward from Koetong at an elevation of about 2,100 feet above sea-level. The bedrock or country rock is granite. On the west side of the creek there is a Tertiary (Newer Pliocene) deposit that stretches for 3 or 4 chains back from the creek, with a semi-rounded gravel of quartz derived from the immediate

locality. The depth of the overlying red soil, the mottled clays, and the wash all combined is about 8 to 12 feet, and the run of payable wash appears to be about 1 chain wide where the dredging plant is at work.

A section is as under:—



Scale, 4 chains to 1 inch.

FIG. 13.

Sketch Plan of Copper Lode at Accommodation Creek.

GRANITE.

The quartz pebbles are of granite veinstones and they are frequently studded with fine needles of black tourmaline. Specks of cassiterite the size of currants and up to that of raisins are not uncommon in them. The cassiterite is of the peculiar brown colour that characterizes the ore in this district. It is not so thoroughly rounded as it is further down the creek. The paddock so far excavated is about $\frac{3}{4}$ acre in area, and from it over 8 tons of tin ore is said to have been won. This should be very profitable to work, but some difficulty has been experienced through employing unsuitable plant. A Jenning's pump was at first used but is now dismantled and a dredge is being worked.

There is a great deal of titaniferous iron ore with the cassiterite—8 tons titaniferous iron to 1 ton cleaned tin oxide, so the manager informs me. A sample of the concentrates examined at the Mines Laboratory was found to consist principally of titaniferous iron, with a little quartz and some garnet fragments, and about 1 per cent. of cassiterite. This sand also contains some monazite, rutile, and zircon. If it can be worked profitably there is a considerable length of the wash yet to be dealt with higher up the creek. Below this site the stream tin was worked by sluicing about 30 years since.

About 1 mile westerly, on the road to the Annandale Syndicate's workings, there is Tertiary country that would be worth boring to discover whether it carried alluvial tin or not.

The Annandale Syndicate.

The ground worked by this syndicate lies about 3 miles in a westerly direction from the Excelsior workings, and is about 2,100 feet above sea-level. The nature of the deposit worked is much the same. First there is red soil for 3 or 4 feet, then mottled clays for 4 or 5 feet with 2 to 5 feet of wash at the bottom resting on decomposed granitic rock.

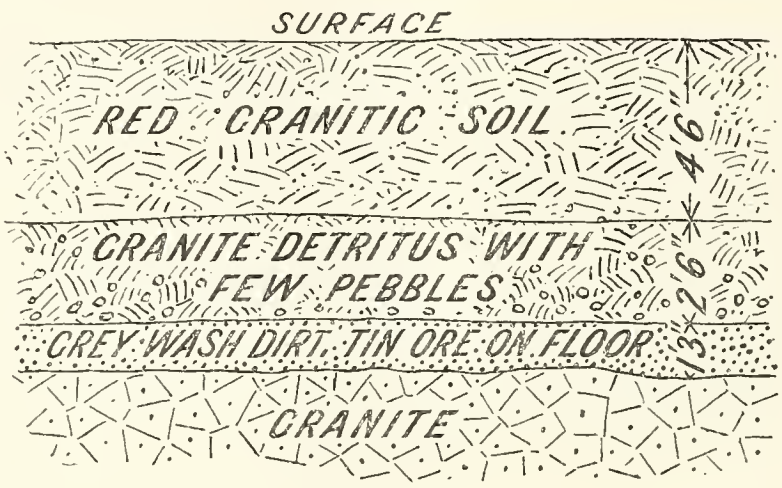


Fig. 14.

Sketch Section at the Excelsior Tin Mine, Koetong.

The method of working here is by means of a tail race and sluicing, but the water supply is rather limited, and the water has to be brought for some miles. The wash-dirt containing the tin ore is much more water-worn than at the Excelsior ground, and quartz pebbles containing tin ore are very common. The quartz is evidently from granitic country and contains abundance of black tourmaline. There are occasional pebbles of pink colour and somewhat fibrous texture. Here also a great deal of titaniferous iron is saved with the cassiterite and in about the same proportion as at the Excelsior workings. No very large pieces of tin ore appear to have been found in this tract. The Tertiary doposit here is right on the divide and there is some reason to expect that it would be worth while to prospect the surrounding country for other portions of what must have been a once continuous lead, the source and end of which has not yet been determined. About a mile northward some quartz veins carrying tin ore were tested in a small way many years ago but nothing further has been done, although some very rich nuggets of tin ore were got there. Altogether several acres of stanniferous gravels appear to have been worked profitably in the Annandale neighbourhood, and there would be more work still to do if water could be got for the purpose, but there is only the one

race and that is being used by Mr. Grant's party. The northern drainage runs into Royal Park Creek which empties itself into Koetong Creek from the west side above Koetong, while to the south-west a creek rises that flows into Dry Forest Creek.

Dry Forest Creek.

The workings on this creek are about 3 miles a little south of west from the Annandale claim; height about 2,000 feet above sea-level.

A tail race has been blasted through a granite bar so as to work the alluvial wash in the flat above and a few chains further up the pipes for a hydraulic plant are laid down the hill, but were not in use. The material to be dealt with consists of angular and sub-angular creek wash of recent age and from 5 to 10 feet in depth. The bottom is decomposed granitic rock with much silvery mica. This ground could probably be worked more profitably by a co-operative party with a small pump. The tin ore found here is remarkably well rounded and of brown colour. It is of good quality and of small grain.

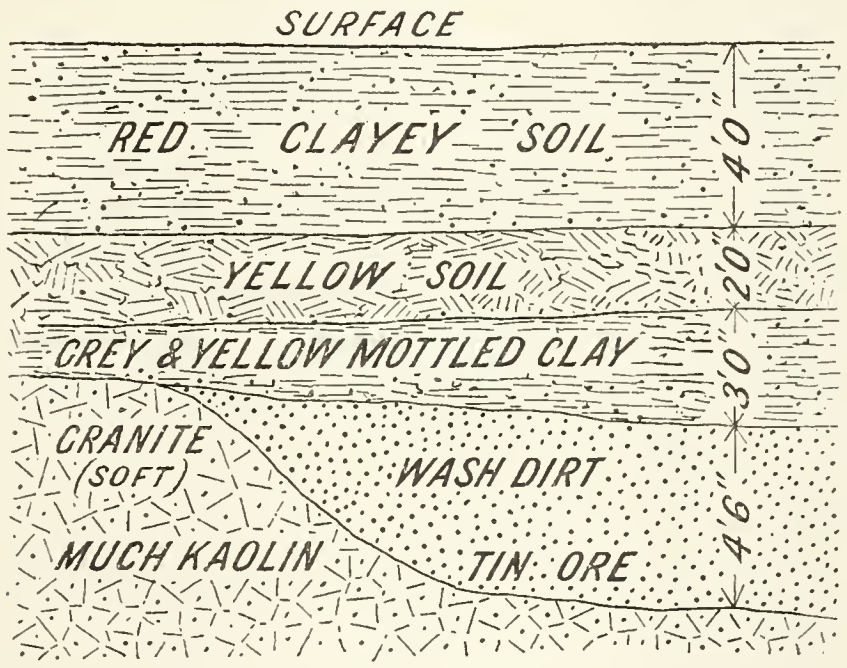


FIG. 15.

Sketch Section, Annandale Syndicate's Claim, Koetong.

At Burrowye Creek, about 5 miles north-east from Koetong, two men are working for tin ore. Formerly a considerable quantity of tin ore was found on this creek. Altogether there is a wide belt of stanniferous country at Koetong, and there should be room for prospectors in this district.

A little gold occurs with the tin ore in this tract, but not in sufficient quantities to pay for extraction.

From Koetong to Berringama the country is granitic rock. Slate and sandstone country begin about half-a mile east of Berringama. About 8 miles east of Koetong the road passes over the highest point, about 2,600 feet above sea-level. Berringama is about 1,400 feet above sea-level.

At Burrowye (Mrs. Shelley's) the creek has been worked for about 2 miles along its course for stream tin. At the head of Boundary Creek, Berringama, a hydraulic plant was erected but was not a success.

Mount Cudgewa.*

Mount Cudgewa is about 12 miles southward from Berringama and rises about 3,650 feet above sea-level. The Cudgewa Creek rises here and flows down past Mr. Mildren's place, and has been worked along most of its course for tin ore. Very rich returns are said to have been obtained along the bed and banks of the creek, richer than anywhere else in the State.

The country rock is generally granitic along the course of the creek, and on the top of Mount Cudgewa the rock is grano-diorite. It is in the grano-diorite and in the metamorphic rocks resting upon it that the tin ore is met with in quartz lodes. The northern slope of the mountain near the hut is thickly strewn with vein quartz, some of which has much black tourmaline present and in other cases silvery mica occurs in tufts; grains and pieces of tin ore up to an inch across are found in some of these loose fragments. The quartz veins have been opened up right on the ridge, and the vein-stone found in the shallow holes is well studded with tin ore.

The quartz veins where opened up are from 2 inches to 4 feet in thickness, but most of them do not appear to be more than 1 foot thick, and the splashes of tin ore occur most irregularly. The lodes are in some cases fairly persistent and may be traced for a few chains in length. They generally appear to strike more or less east and west and dip to the north. The veins do not fill fissures but have formed by segregation from the mass. This is clearly demonstrated by the material tipped from the tunnel. Trenches and shallow holes have been dug and shafts up to 60 feet deep have been sunk in prospecting the lodes on the top of the ridge, and some good work has been accomplished in this manner. Still further to test the nature and value of the lodes, a tunnel has been driven from the south side of the ridge in a northerly direction and about 150 feet below the top of the ridge. This is now very hard country (granitic) and is 250 feet in from the mouth. Two veins of quartz carrying tin ore have been cut, but the distance driven is not enough to intercept the lodes that show most strongly at the surface, especially as they have a northerly dip. This tunnel should be continued for another 200 feet, and it would then afford an excellent means of judging whether these stanniferous lodes are of economic value, and if they are, the tunnel would offer facilities for extracting the ore cheaply.

The lodes show best right on top of the ridge above the tunnel. The most easterly hole, which is about 5 feet deep, exposes a quartz lode 4 feet thick. This is the thickest lode so far opened. One chain south of this is another small opening showing a quartz lode with tin ore in it. From the 4-ft. lode trenches and shallow holes have been made for a length of about 5 chains, and what is probably the same lode is laid bare at intervals to the 60-ft. shaft. The most westerly opening is north of the 60-ft. shaft. The quartz lode in these openings would average about 11 inches thick, and it carries a good percentage of cassiterite in crystals and irregular pieces. A cross-lode occurs striking W. 10 deg. N. and it is about vertical. The quartz is 2 inches thick and rich in tin oxide; gold has been seen in this lode. This vein should pay for extraction while it traverses the decomposed rock, but when the hard granitic rock is reached it would be expensive to work such a thin lode. A shaft 16 feet deep has been sunk on this lode, and the stone is as well studded with cassiterite at the bottom as at the surface.

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* See Professor Gregory.—The Mt. Cudgewa Tin-field, Bull. Geol. Surv. Vict., No. 22, 1907.

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locality. The depth of the overlying red soil, the mottled clays, and the wash all combined is about 8 to 12 feet, and the run of payable wash appears to be about 1 chain wide where the dredging plant is at work.

A section is as under :—

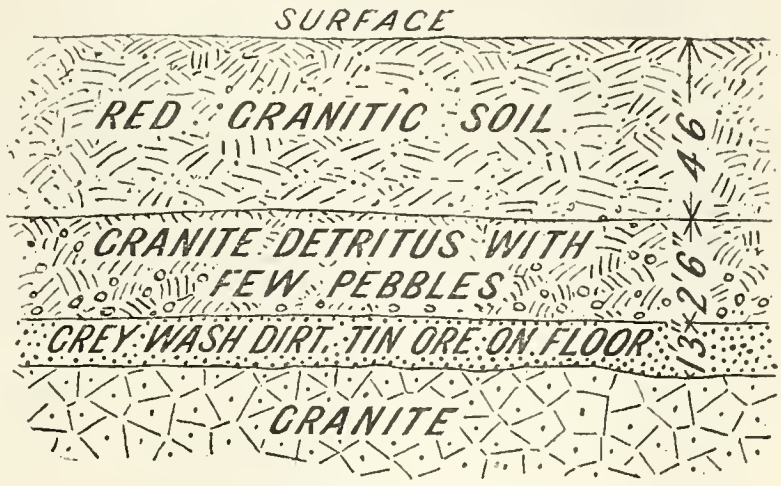

FIG. 14.

Sketch Section at the Excelsior Tin Mine, Koetong.

GRANITE.

The quartz pebbles are of granite veinstones and they are frequently studded with fine needles of black tourmaline. Specks of cassiterite the size of currants and up to that of raisins are not uncommon in them. The cassiterite is of the peculiar brown colour that characterizes the ore in this district. It is not so thoroughly rounded as it is further down the creek. The paddock so far excavated is about $\frac{3}{4}$ acre in area, and from it over 8 tons of tin ore is said to have been won. This should be very profitable to work, but some difficulty has been experienced through employing unsuitable plant. A Jenning's pump was at first used but is now dismantled and a dredge is being worked.

There is a great deal of titaniferous iron ore with the cassiterite—8 tons titaniferous iron to 1 ton cleaned tin oxide, so the manager informs me. A sample of the concentrates examined at the Mines Laboratory was found to consist principally of titaniferous iron, with a little quartz and some garnet fragments, and about 1 per cent. of cassiterite. This sand also contains some monazite, rutile, and zircon. If it can be worked profitably there is a considerable length of the wash yet to be dealt with higher up the creek. Below this site the stream tin was worked by sluicing about 30 years since.

About 1 mile westerly, on the road to the Annandale Syndicate's workings, there is Tertiary country that would be worth boring to discover whether it carried alluvial tin or not.

THE ANNANDALE SYNDICATE.

The ground worked by this syndicate lies about 3 miles in a westerly direction from the Excelsior workings, and is about 2,100 feet above sea-level. The nature of the deposit worked is much the same. First there

is red soil for 3 or 4 feet, then mottled clays for 4 or 5 feet with 2 to 5 feet of wash at the bottom resting on decomposed granitic rock.

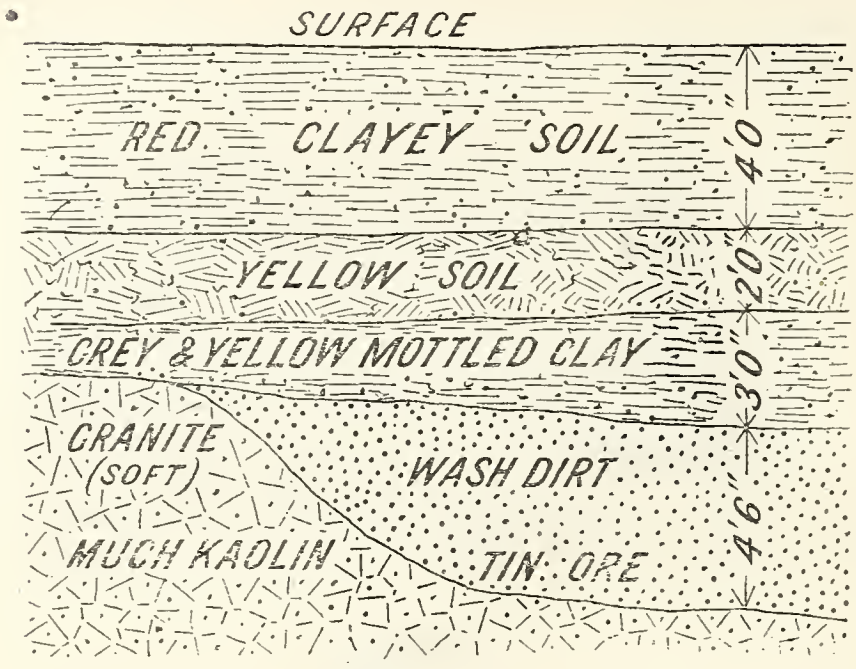

FIG. 15.

Sketch Section, Annandale Syndicate's Claim, Koetong.

The method of working here is by means of a tail race and sluicing, but the water supply is rather limited, and the water has to be brought for some miles. The wash-dirt containing the tin ore is much more water-worn than at the Excelsior ground, and quartz pebbles containing tin ore are very common. The quartz is evidently from ganitic country and contains abundance of black tourmaline. There are occasional pebbles of pink colour and somewhat fibrous texture. Here also a great deal of titaniferous iron is saved with the cassiterite and in about the same proportion as at the Excelsior workings. No very large pieces of tin ore appear to have been found in this tract. The Tertiary deposit here is right on the divide and there is some reason to expect that it would be worth while to prospect the surrounding country for other portions of what must have been a once continuous lead, the source and end of which has not yet been determined. About a mile northward some quartz veins carrying tin ore were tested in a small way many years ago but nothing further has been done, although some very rich nuggets of tin ore were got there. Altogether several acres of stanniferous gravels appear to have been worked profitably in the Annandale neighbourhood, and there would be more work still to do if water could be got for the purpose, but there is only the one race and that is being used by Mr. Grant's party. The northern drainage runs into Royal Park Creek which empties itself into Koetong Creek from the west side above Koetong, while to the south-west a creek rises that flows into Dry Forest Creek.

Dry Forest Creek.

The workings on this creek are about 3 miles a little south of west from the Annandale claim; height about 2,000 feet above sea-level.

A tail-race has been blasted through a granite bar so as to work the alluvial wash in the flat above and a few chains further up the pipes for

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a hydraulic plant are laid down the hill, but were not in use. The material to be dealt with consists of angular and sub-angular creek wash of recent age and from 5 to 10 feet in depth. The bottom is decomposed granitic rock with much silvery mica. This ground could probably be worked more profitably by a co-operative party with a small pump. The tin ore found here is remarkably well rounded and of brown colour. It is of good quality and of small grain.

At Burrowye Creek, about 5 miles north-east from Koetong, two men are working for tin ore. Formerly a considerable quantity of tin ore was found on this creek. Altogether there is a wide belt of stanniferous country at Koetong, and there should be room for prospectors in this district.

A little gold occurs with the tin ore in this tract, but not in sufficient quantities to pay for extraction.

From Koetong to Berringama the country is granitic rock. Slate and sandstone country begin about half-a-mile east of Berringama. About 8 miles east of Koetong the road passes over the highest point, about 2,600 feet above sea-level. Berringama is about 1,400 feet above sea-level.

At Burrowye (Mrs. Shelley's) the creek has been worked for about 2 miles along its course for stream tin. At the head of Boundary Creek, Berringama, a hydraulic plant was erected but was not a success.

Mount Cudgewa.*

Mount Cudgewa is about 12 miles southward from Berringama and rises about 3,650 feet above sea-level. The Cudgewa Creek rises here and flows down past Mr. Mildren's place, and has been worked along most of its course for tin ore. Very rich returns are said to have been obtained along the bed and banks of the creek, richer than anywhere else in the State.

The country rock is generally granitic along the course of the creek, and on the top of Mount Cudgewa the rock is grano-diorite. It is in the grano-diorite and in the metamorphic rocks resting upon it that the tin ore is met with in quartz lodes. The northern slope of the mountain near the hut is thickly strewn with vein quartz, some of which has much black tourmaline present and in other cases silvery mica occurs in tufts; grains and pieces of tin ore up to an inch across are found in some of these loose fragments. The quartz veins have been opened up right on the ridge, and the vein-stone found in the shallow holes is well studded with tin ore.

The quartz veins where opened up are from 2 inches to 4 feet in thickness, but most of them do not appear to be more than 1 foot thick, and the splashes of tin ore occur most irregularly. The lodes are in some cases fairly persistent and may be traced for a few chains in length. They generally appear to strike more or less east and west and dip to the north. The veins do not fill fissures but have formed by segregation from

* See Professor Gregory.—The Mt. Cudgewa Tin-field, Bull. Geol. Surv. Vict., No. 22, 1907.

the mass. This is clearly demonstrated by the material tipped from the tunnel. Trenches and shallow holes have been dug and shafts up to 60 feet deep have been sunk in prospecting the lodes on the top of the ridge, and some good work has been accomplished in this manner. Still further to test the nature and value of the lodes, a tunnel has been driven from the south side of the ridge in a northerly direction and about 150 feet below the top of the ridge. This is now very hard country (granitic) and is 250 feet in from the mouth. Two veins of quartz carrying tin ore have been cut, but the distance driven is not enough to intercept the lodes that show most strongly at the surface, especially as they have a northerly dip. This tunnel should be continued for another 200 feet, and it would then afford an excellent means of judging whether these stanniferous lodes are of economic value, and if they are, the tunnel would offer facilities for extracting the ore cheaply.

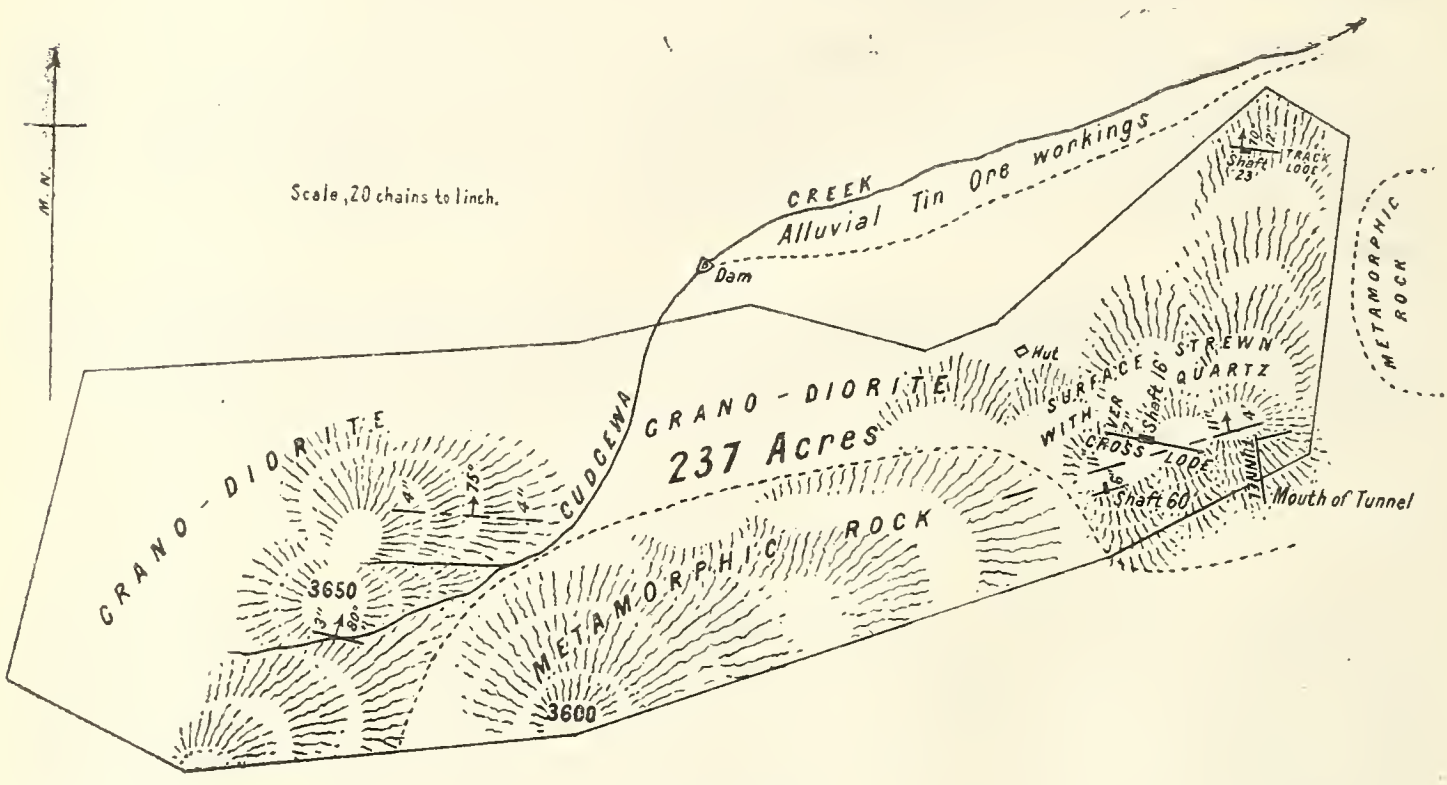


FIG. 16.

Sketch Plan showing Tin Lodes, Mt. Cudgewa.

The lodes show best right on top of the ridge above the tunnel. The most easterly hole, which is about 5 feet deep, exposes a quartz lode 4 feet thick. This is the thickest lode so far opened. One chain south of this is another small opening showing a quartz lode with tin ore in it. From the 4-ft. lode trenches and shallow holes have been made for a length of about 5 chains, and what is probably the same lode is laid bare at intervals to the 60-ft. shaft. The most westerly opening is north of the 60-ft. shaft. The quartz lode in these openings would average about 11 inches thick, and it carries a good percentage of cassiterite in crystals and irregular pieces. A cross-lode occurs striking W. 10 deg. N. and it is about vertical. The quartz is 2 inches thick and rich in tin oxide; gold has been seen in this lode. This vein should pay for extraction while it traverses the decomposed rock, but when the hard granitic rock is reached it would be expensive to work such a thin lode. A shaft 16 feet deep has been sunk on this lode, and the stone is as well studded with cassiterite at the bottom as at the surface.

Further south-west a shaft has been sunk 60 feet on a quartz lode that strikes E. 10 deg. S., and dips north for 20 feet, and then dips south to the bottom of the shaft. Thickness of lode 6 inches. Portions of the lode are rich in tin oxide, but no systematic tests have been made to determine the exact percentage. About 1 chain north from this shaft is an exposure of a quartz lode 11 inches thick with a little tin oxide through the quartz. Still further west thin veins of tin ore occur in the metamorphic rock.

In all the above lodes tourmaline (black) occurs more or less abundantly, and in many of them tufts of white mica are abundant, especially along the sides of the lodes.

On the western side of the gully, at the head of Cudgewa Creek, two small lodes bearing tin oxide have been opened up. The northern one has been traced for 10 chains in length by shallow openings. The strike is E. and W., dip 75 deg. N., thickness 4 inches. Cassiterite occurs freely distributed through the quartz lode, and there is a considerable proportion of black tourmaline present. The southern one strikes a few degrees to the N. of W. and dips 80 deg. N. It is a quartz vein with cassiterite and black tourmaline and 3 inches thick. Very little work has been done on it.

The Track lode is near the north-east corner of the lease. A shaft is sunk 23 feet. The lode is of quartz with black tourmaline. The strike is about E. and W., dip 70 deg. N., thickness 12 inches. A fair amount of cassiterite in rather large grains is distributed through the quartz.

An interesting feature is the presence of scheelite in the lodes with the tin oxide. At the 60-ft. shaft it is particularly plentiful. Wolfram was not observed. Rutile is also commonly present with the alluvial cassiterite, which has been extensively worked on the south bank of the Cudgewa Creek, and from which extremely good returns are said to have been won. A little gold is also found. These workings are just outside the present lease. South of the workings and stretching up the slopes towards the crest of the mountain the surface is thickly strewn with quartz derived from quartz lodes. Cassiterite is not uncommon in small grains and pieces in these fragments from the lodes, and in all likelihood there is alluvial tin ore that would be profitable to work if water could be brought to this level for sluicing. To the height at which water is available, the ground has been sluiced with profit. It is noticeable that there is very little titaniferous iron associated with the cassiterite on the mountain itself (20 tons of cassiterite to 1 ton of titaniferous iron sand), while lower down the same creek the proportion is about eight of titaniferous iron sand to one of cassiterite. This implies that the titaniferous iron is derived from the granitic rocks drained by the creek, but that it does not occur in the lodes or in the rock containing them on Mount Cudgewa.

The cassiterite obtained along the south bank of Cudgewa Creek at its source is angular and in coarse grains; it is of the brownish colour peculiar to this tract of country. Lower down the creek the grains become more and more rounded.

In the tunnel driven from the south side of Mount Cudgewa in a N. 10 deg. W. direction for 250 feet, the first 70 feet was through soft picking rock (decomposed granitic material). At 200 feet in, an intensely hard bluish-grey rock was encountered in which are white felspathic veins with a little tin oxide occasionally present. At 195 feet in, a segregatory vein of quartz 2 feet wide with some cassiterite disseminated through it was cut. At 224 feet in, a segregated quartz vein 6 inches thick also carrying a little cassiterite occurs, but the downward continuation of the lodes showing on the top of the crest has not yet been reached.

About 1 mile east from Mount Cudgewa, along the main ridge, Mildren and Nugent's lodes are met with at about 800 feet below the level of the principal lodes on the mountain. As Professor Gregory points out, this does not imply that the lodes live for a depth of 800 feet. These lodes are in the same granitic rock and run nearly east and west. The northern lode is of quartz with felspar and black tourmaline, and a good sprinkling of cassiterite through the quartz, and is 9 inches thick. Three chains south of this lode is a quartz lode with much black tourmaline; in parts it is well studded with cassiterite. Only surface holes have been sunk here. These lodes deserve a thorough trial.

The lodes, though mostly small, are the most promising yet found in Victoria, but whether they can be worked profitably has to be proved. This work could be best accomplished by continuing the tunnel for another 150 or 200 feet in its present direction, and this work should certainly be done. The Messrs. Mildren of Berringama have done excellent work in opening up these lodes.

Mr. D. J. Mahony, M.Sc., F.G. S., examined a hand specimen of the Mt. Cudgewa rock and reported as follows:—

The specimen examined was collected by Mr. E. J. Dunn from the tunnel which is being driven to intersect the tin lodes at Mount Cudgewa, and is a typical example of the undecomposed part of the rock forming the top of the mountain. It is a grey-coloured rock of the granite type, moderately fine grained and even is texture and consisting of quartz, white or greenish felspar and black mica; specific gravity 2.66. The quartz and felspar are granular and only a few of the felspars have any distinct crystal form. The largest of these, which is simply twinned and appears to be orthoclase, is a quarter of an inch long, but as a rule the felspars are not more than half this size. Many of them have a peculiar greenish tint and a greasy lustre due to alteration or decomposition. The quartz which is rather less plentiful than the felspar occurs in irregular grains of about the same size and is of the usual granitic type. The mica is plentiful, and as a rule is evenly distributed through the rock, but in some places has segregated into small patches. It sometimes has hexagonal outlines but is usually ragged. The plates are about 1-16th inch across. There are joint planes through the rock in two directions, and along one of these there is a little pryites.

Under the microscope (rock sections Nos. 1116 and 1116A) the rock has a typical granitic structure, and intergrowths of quartz and felspar are common. It consists of quartz, orthoclase, plagioclase, and biotite, with a little magnetite, apatite, zircon, colourless garnet, brown tourmaline, chlorite, and (?) fluorite.

The plagioclases probably represent more than one species as the character of the twinning striae varies a good deal in different individuals. They have often sharp crystalline outlines and zone structure is common. Sections suitable for the measurement of extinction angles are not common in the slices, but one section gave symmetrical extinctions at 21 deg., so that this rock may be classed with the grano-diorite group. Orthoclase is less common and has crystallized after the other felspars and occupies the spaces between them. It is sometimes twinned according to the Carlsbad law, sometimes untwinned. The felspars are often partly decomposed to a dusty-looking mineral (? kaolin) and white mica, and the decomposition often begins in the centre of the crystal.

The quartz is of the usual granitic type, full of minute bubbles and small rod-like crystals.

The mica is brown and intensely pleochroic and contains small crystals of apatite and zircon surrounded by pleochroic haloes. All stages of alteration due to leaching can be observed beginning with the fading of the colour and brightening of the interference tints and ending with a colourless mica.

[*Report sent in 25.5.07.*]

SILVER-LEAD ORE AT PINE MOUNTAIN.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The Silver-Lead lode occurs on the south-west side of Pine Mountain at the head of Pine Mountain Creek. It is about 1,300 feet above sea-level. The Tintaldra Silver-Lead Mining Company is carrying on operations to explore this lode.

The first tunnel was driven on the north-east side of the hill and on the south-west side of the creek. First, a cross-cut of 50 feet was driven through granite country to the lode, then a vein of fluorite, quartz, &c., 3 feet thick was crossed. On the hanging wall there is 6 inches of very pure galena, then 30 feet of lode material (siliceous), then another vein of fluorite, quartz, &c. 5 feet thick in which there are splashes of galena, then 6 feet of lode material (siliceous) and not through the lode. At this site the lode is a contact one; it runs along the junction of the granitic and Ordovician rocks which consist of altered slate and sandstone beds. The lode strikes about north-west and dips south-west at about 66 deg. It exceeds 40 feet in width and the south-west wall has not yet been reached.

At the mouth of the tunnel there is abundance of fluorite that has been broken out of the lode. It has lumps of very pure galena embedded in it.

Two hundred and fifty feet N. 30 deg. W. from this first tunnel on the south-west bank of the creek and about 150 feet lower in altitude, a tunnel is being driven in a direction S. 11 deg. W. It is in 275 feet. At 263 feet in, the granite country rock was passed through and the lode entered. The country rock is porphyritic granite. The lode material is a crushed siliceous rock with yellowish-green serpentinous films, and through this lode material are veins up to 1 inch thick of purple fluorite with occasional specks of galena. Further in the lode larger quantities may be expected when the thicker veins of fluorite are cut. This tunnel should be continued right through the lode so as to expose its full width. The tunnel is about 33 feet above the level of the creek.

About 300 yards further up the creek a cut has been put into the north-east bank to the lode. It is about 12 feet deep. The lode is 7 ft. 6 in. wide at the surface, and at the bottom it is rapidly widening out. A shallow shaft 8 feet deep has been sunk in the floor of the cutting on the lode, and a great improvement even at that depth is evinced, and much galena shows through the lode material and some fluorite veins also occur. The galena has an altered appearance and has been changed by atmospheric causes. Permanent water-level has not yet been reached.

This is the proper site for testing the lode by means of a shaft which should be sunk on the south-west side of the creek. At this point the lode is entirely in granite, and northward it may continue in that rock, while southward the lode follows the junction of the granite and sedimentary rocks.

By sinking a shaft to a depth of, say, 100 feet, the lode would be cut below water-level and its normal character would be determined. All the material in the lode above water-level has been subjected to leaching, oxidation, &c., and, therefore, it does not afford a true index to the character of the ore to be met with in the unaltered portion of the lode. This spot is about 4 miles from the main road up Pine Mountain Creek, and a small expenditure would suffice to make a good dray road to it.

The strike of the lode at this site is north-west and south-east, dip 60 deg. S.W. The lode is remarkably well defined and strong where opened out and is said to be traceable for fully a mile in length. It has all the appearance of being of a most permanent character and possesses especial interest on account of the abundance of fluorite which occurs as veins from mere threads up to massive bands with quartz as much as 5 feet wide. Through this fluorite the galena is distributed as kernels and masses. The fluorite is of amethyst colour when first broken out but on exposure it bleaches white. It shows a beautiful ribbon structure. The occurrence of so much fluorite has not been previously noted in the State. From all the circumstances and the high grade galena obtained above water-level, where the ore has been subjected to much leaching, it is to be expected that below water-level high class galena in greater quantity will occur. The work of sinking a shaft and exploiting the lode below water-level should be at once undertaken. It is probable that the water will require to be dealt with by means of efficient pumping plant. There is a good road down the Murray Valley to Bethanga Railway Station which is about 70 miles distant.

[Report sent in 14.5.07.]

CORRYONG AND THOUGLA CREEK.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The Just in Time mine is situated in Carkeek's Gully, on the west flank of Mt. Elliott, about 4 miles E. 20 deg. N. of Corryong, and is about 1,400 feet above sea-level. A tunnel on the north side of the gully has been driven 300 feet and the reef has been stoped along that distance and worked below the tunnel level in some places to a depth of 60 feet. Southward from the gully the tunnel is driven along the reef for 500 feet. At 300 feet in, a shoot of gold has been worked 100 feet in length and stoped up for 70 feet above the level to the surface. Below the tunnel level the shoot has been worked for 200 feet in depth. The strike of the reef is about north and south, dip 75 deg. E., and it is from 4 to 12 inches thick. The strike of the country rock is about N. 20 deg. W., dip 60 deg. E. The shoot of gold dips 70 deg. S. To the north the same reef has been worked for about half-a-mile and to the south for nearly a mile at intervals.

At the Just in Time mine a party is now at work taking out a slice of quartz that was missed by the previous workers and which is expected to yield 3 ounces of gold per ton. Some of the quartz is thickly studded with gold and some very rich yields are stated to have been obtained formerly. The reef is a very persistent one and the depth of 200 feet below the tunnel level to which it has already been worked is only a fraction of the depth to which it may be expected to live. Besides sinking to greater depths this mine requires that the tunnels should be extended so as to prove the

reef both north and south of the present tunnel ends. A feature in this mine is the great purity of the gold, which is worth over £4 2s. per oz. Iron pyrites and other sulphides occur with the gold and the concentrates are likely to be very valuable.

Parallel lodes are stated to occur both to the east and west of this main lode. No crosscuts of an exploratory character have been made through the country from this tunnel.

South-west from the mouth of the tunnel and a little further up the hill is the Prospector's or Post's reef which has been worked from the surface to a moderate depth and for a length of 200 feet. This reef is to the west of the Just in Time reef. The strike is north and south, dip 80 deg. E., and the quartz, &c., is 2 feet thick. The reef crosses the country rock. A crosscut from the tunnel should be extended west to cut this reef in depth.

About 20 chains further south and on the north side of the next gully running westward from the mountain, is the Bull and Damper claim. This has been worked by tunnels at two levels and is now being tried again. On the south side of the gully a level is extended along the reef for 300 feet on the claim known as the Bread and Sugar mine. At the mouth of the tunnel is a large, nearly horizontal, granitic dyke. Where the reef which is 6 to 8 inches thick was intersected by the dyke it was rich in gold. Three tunnels have been driven along the reef on this slope. A shoot of gold about 100 feet long pitching south has been worked in the gully and followed down below the tunnel. The country rock on Mt. Elliott's flank where this line of reef is worked is metamorphic, very micaceous in parts and other parts consist of hornfels and rocks similar to those met with at Maldon. Granite rocks probably underlie the altered beds at no great depth and have produced the metamorphism.

South of the Bread and Sugar tunnel is the old She-oak workings which are idle at present. Several other portions of this reef have been worked further south to where it is hidden under the plain. Tenby's Reward is south of the She-oak claim. Northward of the Just in Time Claim where the three men are working is the Corryong View, with a shaft 60 to 70 feet deep.

Besides the main line of reef on the west flank of Mt. Elliott there are many gold workings that were not visited. On the north end of the mount the Dig, the Welcome, the Mary Jane, the North New Chum (this was extremely rich in gold, some of the quartz yielding as much as 16 oz. of gold per ton; the shaft is 300 feet deep), the Englishman, and the Rose of Australia. On the east are the Bandicoot, the Golden Purse, and a large reef unnamed. South of the mount is the Lucky Friday and other claims.

The tract of auriferous country in which Mt. Elliott is situated is of metamorphic character and stretches from Towong southward for 10 or 12 miles with a width of 4 to 5 miles. The Murray River forms its eastern boundary. The whole of this tract offers attractions for the prospector. At present it comes under the neglected gold fields class, as on the whole of this promising country there are but ten men at work. There is a Government battery at Mt. Elliott, and this should facilitate the work of the prospector.

Thougla Creek.

About 10 miles in a southerly direction from Corryong, Thougla Creek leaves the hills of Ordovician rocks and flows through the granitic plain. Two miles higher up is Meurant's. Thougla Creek has been worked along

its course for alluvial gold, and for a short distance the plant has been laid down and a long water-race cut with the object of working the alluvial deposits along the creek by hydraulic means, but the work has not proved a success. About half-a-mile south-east from Meurant's is the Excelsior reef. The slaty country strikes N. 20 deg. W., dip 55 deg. E. A tunnel has been driven in along the course of a dioritic dyke which strikes north-west and dips 75 deg. N.E. On the south-west side of the tunnel the rock is altered Ordovician. On the north-west side diorite prevails. The quartz at the junction is from 3 to 12 inches thick and this is said to have yielded a few dwts. of gold per ton at the further end. The tunnel is about 1,700 feet above sea-level. On the top of the hill a large quantity of quartz was mined. The reef was 1ft. 6in. thick and in a shaft sunk 75 feet it is said to have been 9 inches thick. Some good returns of gold are reported from this reef and it deserves further prospecting. The dyke can be traced for a considerable distance southward. The country is of favourable character for gold. Bullocky Creek runs into Thougla Creek from the east side and is about 2 miles higher up than Meurant's. Gold has been worked up Thougla Creek to Bullocky Creek and up Bullocky Creek for 3 miles. Fisher's Creek runs into Thougla Creek at the Excelsior reef and was auriferous. Jingalarie Creek runs in from the same side just below Meurant's and was also worked for alluvial gold. The gold here is worth £3 6s. per oz.

About 9 miles up Thougla Creek from Meurant's is Mt. Onslow, where a quartz reef is stated to have yielded 2,000 oz. of gold. Alluvial gold was worked below it.

At the head of Corryong Creek, the tract of country in which the Dark River and Gibbo Creek have their sources, the country is reported as auriferous.

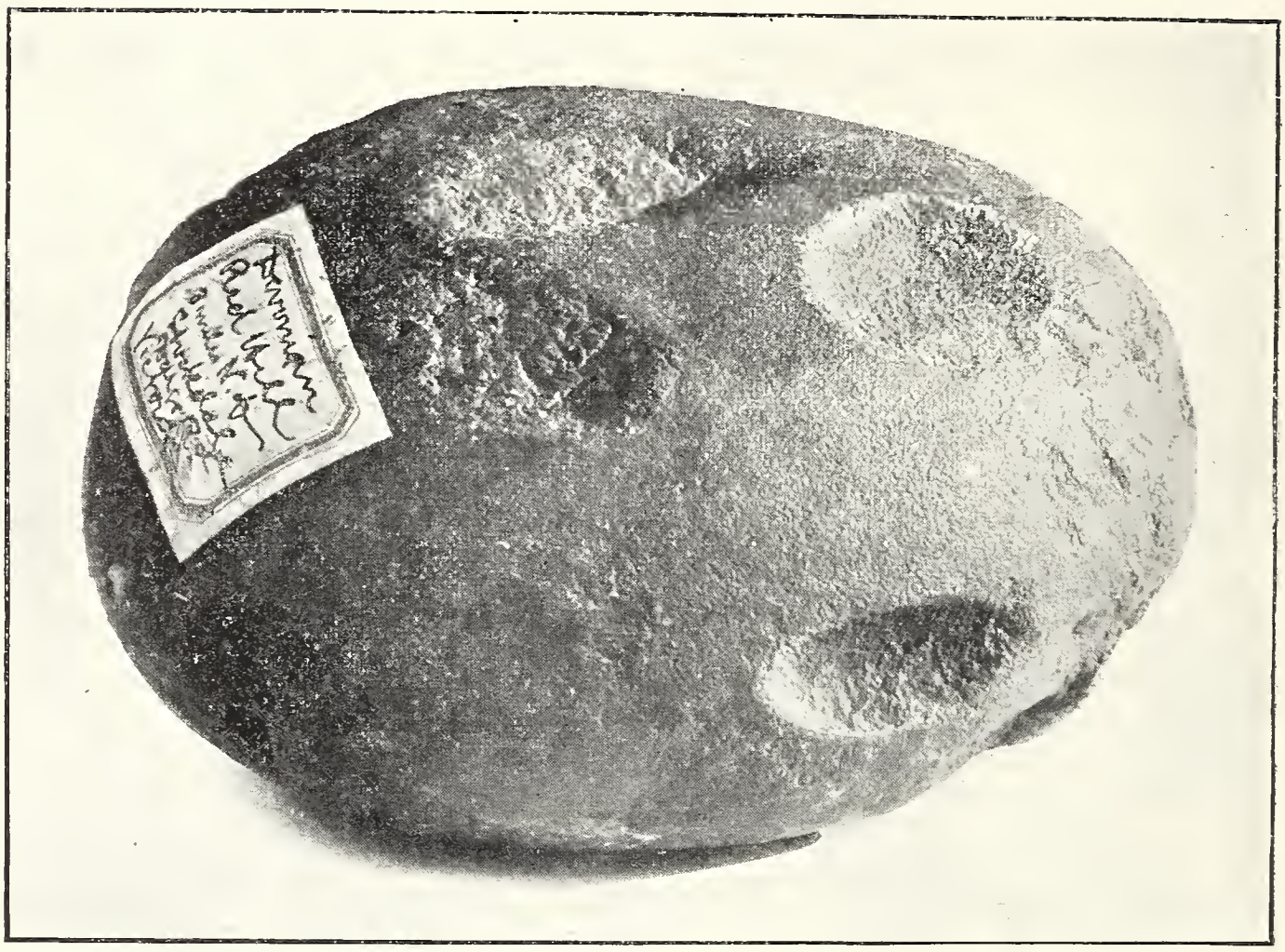
Copper Indications at Corryong.

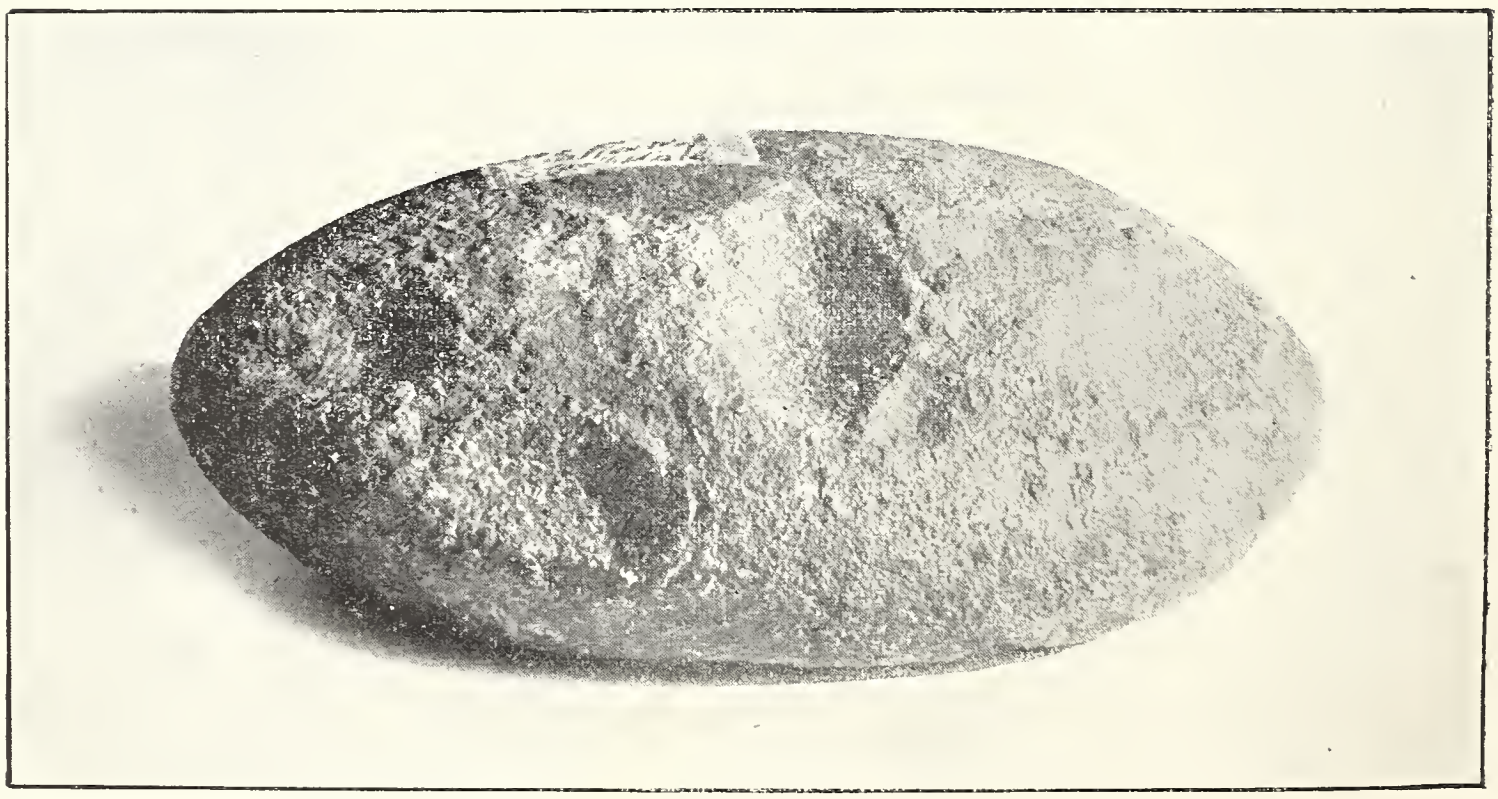
Corryong is situate on a plain about 1,100 feet above sea-level. The country rock is granitic. About 20 chains E. 35 deg. S. from the post office, and 100 feet higher up on the slope of the hill indications of copper have been found, and three shallow shafts have been sunk. The furthest from the town is 14 feet deep. The country rock is granite of normal type but decomposed. A dyke of hard bluish fine grained rock (? diorite), decomposed near the surface, cuts through the granite. Its strike is east and west, dip 75 deg. N. There are no signs of copper ore in the unaltered dyke, but in the softer parts, and apparently following the joints, blue and green carbonates occur in small quantities associated with calc-spar. Sulphide of copper shows at the bottom of the hole. About 95 feet N. 15 deg. E. from the first hole is a second one 15 feet deep; a fracture in the rock runs about north-east with granite on one side and grano-diorite (?) on the other; blue and green carbonates of copper in small quantity occur here also; 60 feet N. 10 deg. W. from this hole is the third shallow shaft 12 feet deep with grano-diorite (?) and granite in contact. Here similar blue and green copper ores occur in small amounts. Further up the hill another opening has been made and at this site the hard dark-bluish dyke rock is exposed, and it also carries blue and green stains of carbonate of copper. No true lode has yet been disclosed, but the work done shows that copper ores exist and possibly lodes of valuable copper ore may be discovered in the district. Useful prospecting work has been done.

[*Report sent in 18.5.07.*]

NATURAL HISTORY

Plate XII.





IMPRESSED PEBBLES.

By E. J. Dunn, F.G.S., Director, Geological Survey.

At Red Hill, about 2½ miles from Stockdale, on the road from Stratford to Dargo, a tract of Devonian rock is crossed. In these rocks there are beds of conglomerate that range from a few inches to over 4 feet thick. The pebbles in the conglomerate consist of quartzite for the most part with here and there one of quartz. They range in size up to 3 or more inches long, and are pink, red, white, and brown in colour.

The unusual feature about the pebbles forming this conglomerate is that they are quite commonly impressed into one another, apparently through the exertion of enormous compressing forces. Many of the hollows that have resulted are up to an eighth of an inch in depth and several depressions are to be found on some pebbles. Why some pebbles were thus forced into others does not appear unless the pebbles varied in hardness and the softer pebbles had the others forced into them. A remarkable feature about the pebbles with depressions is that they have not apparently been deformed in any way. The edges of the depressions even are not raised as might have been expected, and the general contour of the pebbles appears not to have been disturbed.

The hollows are not smooth but very uneven and rough. Sometimes the point of one kind of pebble remains imbedded in another. Probably when one pebble was invaded by another the action was extremely slow. Very beautiful examples are obtainable, and the hollows are in many cases unusually well marked. Similar occurrences have been met with by Professor Judd, F.R.S., and others in Scotland and on the Continent, but none to excel these in the clearness and depth of the impressions.

Quartz of secondary formation is to be seen in some of the hollows, so that it is possible that the hollows have resulted from a solvent action. Minute crystals of quartz are to be seen on the surface of some of the pebbles.

[*Report sent in 8.6.07.*]

THORIANITE.

By E. J. Dunn, F.G.S., Director, Geological Survey.

Captain Collins, of the Commonwealth Offices, London, has sent a specimen of the new mineral, thorianite and draws attention to its great commercial value. It has brought as much as £1,600 per ton, but is now much lower in price. The great variations in the value of thoria are partly due to the trust which regulates market values.

As monazite, another thoria-yielding mineral, occurs in Victoria, it is possible that thorianite may also be found. In appearance this mineral so exactly resembles in crystalline form and in colour the common limonite pseudomorph after pyrites that it might easily be overlooked. The specific gravity of thorianite is however nearly twice that of limonite.

The characteristics of thorianite, determined by Professor Wyndham Dunstan, are:—Colour—dull-black to dark-brown on weathered surfaces, but bright-black where newly fractured. Streak—Brownish, with green tinge. Hardness—7. Specific gravity—8 to 9.5. Blowpipe tests—Infusible, but decrepitates and gives off bright scintillations. In borax and microcosmic salts gives uranium reactions. In reducing flame gives green colour. Composition—ThO_2 58 per cent. to 79 per cent., Uranium oxide—52 per cent. to 13 per cent. It contains a considerable amount of occluded helium. Occurs in Ceylon in river gravels with other minerals of high specific gravity, such as ilmenite, zircon, and spinel.

Salts prepared from it are used for incandescent mantles. One of the best means of testing whether a mineral is thorianite or a pseudomorph after pyrites is by its action on a photographic plate. A piece of lead or tin an inch square with a hole pierced in the middle is laid on the film of the plate, and the hole in the metal is covered with the mineral. This operation must be carried out in the dark. Then the plate, &c., must be left in a completely dark place for a day or so. If an image of the hole is found on developing the plate in a dark room the mineral is probably thorianite or some similar radio-active mineral. If in its other characteristics it corresponds to thorianite there can be little doubt that it is that mineral.

[*Report sent in 16.7.07.*]

JURASSIC PLANT-REMAINS FROM GIPPSLAND.

Part II.

By Frederick Chapman, A.L.S., &c., Palæontologist to the National Museum.

The plant-remains described in Part I. of this paper were collected at the one locality, Whitelaw Railway Station yard, South Gippsland. The present series, with the exception of Nos. 1021-1026 collected by Mr. A. M. Howitt at Merino in the Western District, come from various localities in South Gippsland. Those numbered up to 1250 were collected by Mr. A. E. Kitson, F.G.S., and the remainder by Mr. W. H. Ferguson.

Mudstone. Outtrim Bridge Railway Cutting.—Nos. 279-285 and 675-691.

Roots of (?)*Equisetites*.—Nos. 682, 683.

Coniopteris hymenophylloides, var. *australica*, Seward.—Nos. 280-282, (?)284, (?)285, 689-691.

Ditto, part of a large, well-grown frond. Also *Taeniopteris spatulata* and its variety, *Daintreei*.—No. 675.

C. hymenophylloides, var. *australica*, *T. spatulata*, and var. *Daintreei*. Nos. 679, 680.

Taeniopteris spatulata and var. *Carruthersi*.—No. 677.

Taeniopteris sp.— No. 279.

Sphenopteris ampla, McCoy.— Nos. 279, 283.

Sphenopteris sp.—Nos. 685, 686.

Baiera, cf. *australis*, McCoy.—Nos. 681, 687.

cf. *Albertia australis*, McCoy.—No. 688.

Carpolithes sp. and *Taeniopteris* (fragment).—No. 684.

Plant-remains, indet.— No. 676.

Mudstone.—Outtrim Bridge Railway Cutting. N. side.—Nos. 669-671 and 1123-1155.

Coniopteris hymenophylloides, var. *australica*.—No. 1123.

Taeniopteris spatulata.—Nos. 1146, 1147.

T. spatulata, var. *Daintreei*.—Nos. 1123-1131, 1132 (some of the leaves excessively narrow—1.5 mm. in width), 1133-1147, 1149, 1150, 1151(laminæ showing surface-pittings probably due to scatered hairs similar to those seen on the rachis), 1152-1155.

Carpolithes sp. ; bean-shaped seeds. Also *Taeniopteris* leaves.—Nos. 660 (figd.), 670, 1150, 1152.

Carbonized woody fragments.—No. 671.

Plant-remains. indet.—No. 1148.

Cutting near Outtrim North Railway Station.—No. 672.

Equisetites sp. Stems and nodal diaphragms (figured).

Mudstone. Hamman's Coal-seam, Ruby Creek, Koorooman.—Nos. 294, 1092, and 1194-1229.

Thinnfeldia Maccoyi, Seward.—Nos. (?)294, 1092, (?)1210, 1215-1217.

Sphenopteris ampla.—Nos. 1200, 1202, 1203, 1205, 1206.

Taeniopteris spatulata.—Nos. 1196, 1198, 1199, 1203, 1204, 1207, 1211-1213, 1217-1222, 1225, 1226.

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* Rec. Geol. Surv. Vict., Vol. II., Pt. 4, pp. 212-220, 1908.

T. spatulata, var. *Daintreei*.—No. 1208.
T. spatulata, var. *Carruthersi*.—No. 1194, 1196, 1201, 1202, 1209, 1211, 1214, 1228, 1229.
Rhizomopteris Etheridgei, Seward.—No. 1213.
Podozamites ellipticus, McCoy.—Nos. 1205, 1220, 1223, 1224, 1227.
Podozamites Kidstoni, Eth. fil. (see note in Appendix).—No. 1198.
Carpolithes sp.—No. 1208.
Plant-remains, indet.—Nos. 1195, 1197 (woody stem).

Mudstone. Ruby Creek, Koorooman.—Nos. 737-741.
Sphenopteris ampla.—No. 739.
Brachyphyllum gippslandicum.—Nos. 737,(?)740.
Araucarites sp. A cone-scale.—No. 738.
Fossil remains, indet.—No. 741.

Splitters Gully, off Ruby Creek.—Nos. 1237-1240.
Sphenopteris ampla, McCoy.

Gravel Spur, East from Ruby Creek.—Nos. 1241, 1242.
Plant-remains, indet.

Mudstone. Strzelecki Mine (above seam).—Nos. 286-289.
Taeniopteris spatulata, var. *Carruthersi*, T. W.—Nos. 286, 288, 289.
Shale specimen with two examples of a seed comparable with Seward's *Carpolithes* sp. A (see Rec. Geol. Surv. Vict., Vol. I., pt. 3, 1904, p. 182). —No. 287

Mudstone. Strzelecki.—No. 744.
Carbonized stems of plants, indet.

Mudstone and indurated shale. Coal Creek, shaft No. 1.—Nos. 692-724.
Coniopteris hymenophylloides, var *australica*, Sew.—Nos. 701-704, 717, 718 (part of a frond having deeply incised lobes to the pinnules, resembling Stirling's '*Sphenopteris Fosteri*,' 720.
Sphenopteris ampla, McCoy.—No. 724.
Taeniopteris spatulata.—Nos. 704, 720
Taeniopteris spatulata, var. *Carruthesri*.—Nos. 702, 704.
Taeniopteris spatulata, var. *Daintreei*.—No. 719.
Taeniopteris sp.—No. 717.
Rhizomopteris Etheridgei, Seward.—Nos. 692-696, 699, 706-711, (707 figd.). Part of a stem, in places 16 mm. in width, associated with remains of the above (692). Stems with fine curling filaments (693 figd., 696, 706). Stem fragments, silicified, and showing casts of sieve-tubes when highly magnified (694, 700). Stems showing bases of rootlets (707); also nodes on the stems (707). An example showing branching habit (708). A stem with large crescentic scars (711). Fragments of slender grooved stems, associated with *Sphenopteris ampla*.—No. 724.
Plant stems, indet.—Nos. 697, 698, 705, 712-716.
Densely matted stems in a carbonized shaly seam.—Nos. 721, 723.

Indurated shale, Proprietary Mine, Coal Creek.—Nos. 775-796.

Rhizomopteris Etheridgei, Seward. This important and interesting series of specimens contains evidence of the actual relationship of the plant remains hitherto referred to as *Taeniopteris* and *Rhizomopteris* respectively (see Appendix). One of the specimens shows the rhizoma with the basal portions of fronds of *Taeniopteris* of the varietal form, *Daintreei*, crushed in various positions along the creeping stem (778). In other examples (as in 775 figd.), numerous leaves of *Taeniopteris* occur flattened out and lying across the rhizomes. There are also numerous seed-like bodies, or possibly root-nodules, measuring about 2 mm. in diameter, lying pressed against these creeping stems (shown particularly in 783). No. 779, a stout stem, with bases of attachment of the frond petiole, No. 782 (figd.), a rhizome showing part of a single vascular bundle, silicified, and standing out from the matrix. Stems with siliceous casts of vascular tissue, 784, 792. Rhizomes with large petiolar scars, 789, 790, 795, 796 (figd). A petiole attached to a rhizome, showing the crescentic form of the area, 785. Massive rhizomes, 786, 787, 791, 793, 794.

Taeniopteris spatulata.—Nos. 778, 783, 785, 788.

Taeniopteris spatulata, associated with *Rhizomopteris.*—Nos. 778, 783, 785.

Plant-remains, indet.—Nos. 777, 780, 781.

Mudstone with leaf impressions. N.W. corner, Allot. 100A, Allambee East.—Nos. 1076-1091.

Cladophlebis denticulata, var. *australis.*—Nos. 1077, 1078, 1082, 1085, 1086, 1088, 1089, 1091.

Taeniopteris spatulata var. *Carruthersi.*—Nos. 1079, 1083, 1085, 1090.

T. spatulata.—No. 1078.

T. spatulata, var. *Daintreei.*—Nos. 1076, 1084, 1087.

T. spatulata, var. *crenata*, McClelland.—Nos. 1076, 1079 (figd.), 1081 (figd.), 1082.

Thinnfeldia Maccoyi, Seward.—No. 1082.

(?)Stem of a fern.—No. 1080.

Mudstone. Road between Allots. 69C and 69D, Allambee.—Nos. 597-604.

Taeniopteris leaves (fragmentary), mainly referable to *Taeniopteris spatulata*, var. *Carruthersi.*—Nos. 597-600, 602-604.

Woody fragments and (?)Araucarian cone-scales.—Nos. 597, 599, 600.

Stems of (?)ferns.—No. 601.

Ferruginous sandstone. San Remo.—No. 293.

Rhizomes of (?)ferns. Cylindrical casts enclosing a central axis, and with scars of rootlet attachments. Compare *Rhizomopteris Etheridgei.*

Bore-core of argillaceous sandstone. Hoddinott's Seam, Kilcunda, No. 2 Bore.—Nos. 295, 296.

Taeniopteris spatulata, and its variety *Carruthersi.* Also *Sphenopteris ampla*, McCoy, and carbonized woody fragments.—No. 295.

Equisetites sp. A broad and conspicuously fluted stem, showing part of a node Also associated on the same block are traces of leaf-sheaths of the same type of plant.—No. 296.

Mudstone. Allotment 14, West Creek.—Nos. 636-639.
Coniopteris hymenophylloides, var. *australica*, Seward.—No. 636.
Caniopteris hymenophylloides, var. *australica*. A terminal frond-fragment, resembling *Sphenopteris warragulensis*, McCoy.—No. 637.
Sphenopteris ampla, var. *crassinervis*, McCoy.—Nos. 638, 639.

Mudstone. Fay's Hill, Korumburra.—Nos. 640, 641.
Taeniopteris sp. and *Sphenopteris ampla*, McCoy, on both slabs.—

Mudstone. Heath's Creek, Jumbunna East.—Nos. 643, 644.
Probably *Sphenopteris ampla* (fragmentary), on both specimens.

Ochreous Mudstone. Hodder's Gully, Hedley.—Nos. 645-654.
Sphenopteris ampla.—Nos. (?)648, 649, 651.
Rhizomes and stems of ferns.—Nos. 645, 646, 652, 654.
Indeterminate plant remains.—Nos. 647, 653.

Brown Mudstone. Screen's Railway Section, Jumbunna.—Nos. 655-664.
Coniopteris hymenophylloides, var. *australica*, Sew.—Nos. 657, 659, 663, 664.
Sphenopteris ampla, McCoy.—Nos. 655, 657.
Taeniopteris spatulata, McClell.—Nos. 660, 663.
Taeniopteris spatulata, var. *Daintreei*, McCoy.—No. 663.
T. spatulata, var. *Daintreei* and *Carpolithes* sp.; three examples of an ovate, almost bean-shaped (?)seed, on two slabs.—No. 636.
Stenopteris sp. (figured).—No. 662.
Baiera australis, McCoy.—No. 658.
(?)*Baiera* sp.—No. 664.

Mudstone. Cutting; Jumbunna Line, Korumburra.—Nos. 665-668.
Plant-stems and rootlets, indet.—Nos. 665, 666.
Plant-stems and impressions of ovate (?)seeds.—Nos. 667, 668.

Mudstone. Gooch's Big Cutting, Jumbunna.—No. 673.
Root of (?)*Equisetites* (figd.).

Baked shade. Jumbunna Mine.—No. 674.
Plant-stem or rhizome.

Indurated mudstone. Jumbunna.—No. 725.
(?)*Rhizomopteris Etheridgei*. Numerous stems, deeply grooved; they are silicified, and break up into fibres, consisting of bundles of casts of tracheides.
Sandstone. Townsend Bluff, Anderson's Inlet.—Nos. 726-729.
Woody fragments, (?)cone-scales and seeds, probably of Araucarian affinities.

Kilcunda.—No. 742.
Silicified wood; not sufficiently well preserved for identification.

Mudstone, Welshpool, allotment 22.—Nos. 753-760.

(?)*Equisetites*. Fragments of grooved stems, with traces of leaf-sheaths and imbricated epidermis. Also rhizoma, with fine rootlets.

Sandstone. Elm's House, allotment 55, Jumbunna E.—Nos. 1027-1033.

cf. *Coniopteris hymenophylloides*, var. *australica*.—Nos. 1027, 1030.

Taeniopteris spatulata, var. *Daintreei*.—Nos. 1027, 1030.

Baiera cf. *australis*.—No. 1030.

Carpolithes sp.—Nos. 1027, 1028.

Fragmentary plant-remains, indet.—Nos. 1029, 1031-1033.

Ochreous mudstone. Bena.—Nos. 1093-1110.

Thinnfeldia odontopteroides.—No. 1093.

(?)*Thinnfeldia Maccoyi*.—Nos. 1101, 1108, 1110.

Taeniopteris spatulata.—Nos. 1094, 1095, 1099, 1103, 1109, 1110.

Taeniopteris spatulata, var. *Carruthersi*.—Nos. 1097, 1104, 1108, 1110.

Palissya australis.—Nos. 1096, 1099.

Remains of ferns and coniferales, indet.—Nos. 1098, 1102, 1103.

Plant-remains, indet.—Nos. 1100, 1105-1107.

Ochreous mudstone. Berry's Creek, S. Gippsland.—Nos. 1111-1122.

Cladophlebis denticulata, var. *australis*.—Nos. 1111, 1113-1116, 1117 (an example with very long pinnules measuring as much as 48mm.), 1118-1121.

Taeniopteris spatulata, var. *Carruthersi*.—Nos. 1111, 1112, 1114, 1115, 1119 (laminae very broad, having a width of 26mm. The rachis of one leaf is 3.5mm. in width; it is longitudinally grooved, and the surface is sparsely covered with short pointed hairs or ramenta), 1120, 1121.

(?)*Sphenopteris ampla*.—No. 1122.

Hard mudstone. Keating's Paddock, Archie's Creek.—Nos. 1156 1193.

(?)*Marchantites* sp.—No. 1164.

Coniopteris hymenophylloides, var. *australica*.—No. 1162 (fertile frond, with lobulate pinnules).

Cladophlebis denticulata, var. *australis*.—Nos. 1159, 1161, 1169.

Sphenopteris ampla.—Nos. 1156-1158, 1164, 1166, 1168, 1170, 1172, 1176-1182, 1186-1188, 1191, 1193.

(?)*Sphenopteris*.—No. 1184.

Taeniopteris spatulata.—No. 1192.

Taeniopteris spatulata, var. *Daintreei*.—Nos. 1174-1176, 1192.

Podozamites Kidstoni, Eth. fil. (figured, see note in Appendix),—No. 1173.

Araucarioxylon sp. A tangential section of this example of fossil wood exhibits characters similar to those seen in *Dammara australis*.—No. 1183.

Carpolithes sp.—Nos. 1160, 1184.

Plant-remains, indet.—Nos. 1163, 1165, 1171.

Indurated Jurassic Mudstone, G. Dowell's bore, Kongwak.—Nos. 1230-1236.

Cladophlebis denticulata, var. *australis*.—No. 1233.

Sphenopteris ampla.—Nos. 1230, 1232, 1234.
Plant remains, indet.—Nos. 1231, 1235, 1236.

Kooroomah, allot. 41.—Nos. 1247, 1248.
Plant remains, indet.

Guddon's Well. Allot. 51A, Drumdlemara.—Nos. 1249, 1250.
Sphenopteris ampla.

Olive mudstone. Binginwarri. Allot. 76Bi.—Nos. 1251-1282; and 1334-1341.

Sphenopteris ampla.—Nos. 1255-1257, 1260, 1261, 1263-1267, 1269-1271, 1273-1275, 1281, 1282, 1334, 1337-1341. (No. 1339 figd.)

Tæniopteris spatulata.—No. 1336.

Podozamites, cf. *Kidstoni*, Eth. fil.—Nos. 1254, 1272.

Podozamites cf. *ellipticus*, McCoy.—Nos. 1262, 1276.

Podozamites Barkleyi, McCoy.—Nos. 1253, 1278.

Conites sp. Cone of a gymnosperm, indet.—Nos. 1251, 1336 (figd.).

Araucarites sp. (cone-scale).—No. 1280.

(?)Araucarian stem, indet.—No. 1268.

Brachyphyllum gippslandicum (stems and attached cones).—No. 1252. An example with straight and slender branches, resembling certain forms like *Widdringtonites*.—Nos. 1262, 1279.

Taxites sp.—No. 1252.

Plant remains, indet.—Nos. 1258, 1277, 1335.

Olive mudstone. Binginwarri. Allot. 74H.—Nos. 1283-1303.

Sphenopteris ampla.—Nos. 1287, 1290-1292, 1298-1300, 1302.

Taeniopteris spatulata.—Nos. 1285, 1294.

Baiera australis (fragment).—No. 1283.

Carpolithes sp.—Nos. 1293-1300.

Araucarites sp. (cone-scale).—No. 1284.

Plant remains, indet.—Nos. 1286, 1288, 1295-1297, 1301, 1303.

Mudstone. Binginwarri. Allot 74Bi.—Nos. 1304-1308.
Sphenopteris ampla.

Mudstone. Binginwarri. Allot. 74Bj.—Nos. 1309-1322.

Sphenopteris ampla.—Nos. 1310-1315, 1317, 1322.

Fern stems, probably of *S. ampla.*—Nos. 1309, 1316, 1318, 1321.

Stenopteris elongata, Carruthers. This form is noted for the first time in Victoria, although a characteristic plant in the Queensland and South African Jurassic flora.—No. 1319 (figd.).

Plant stems, indet.—No. 1320.

Binginwarri. Allot. 74Bf. No. 1323.
Sphenopteris ampla.

Binginwarri. Allot. 77B.—Nos. 1324-1333.

Coniopteris hymenophylloides, var. *australisa.*—Nos. 1326, 1327.

Sphenopteris ampla.—Nos. 1324, 1325, 1329, (?)1332, 1333.

Taeniopteris spatulata.—Nos. 1327, 1331.
Stenopteris elongata.—No. 1328.
Plant remains, indet.—No. 1330.

Binginwarri. Allot. 74H.—Nos. 1342-1347.
Sphenopteris ampla.—Nos. 1342-1345, 1347.
Plant remains, indet.—No. 1346.

Binginwarri. Allot. 74J.—Nos. 1348-1350.
Sphenopteris ampla.—Nos. 1348-1350.
Plant stems probably referable to the above.—No. 1350.

Devon. Allot. 157A.—Nos. 1351-1353.
Sphenopteris ampla (fragments of fronds and stems).

Mudstone. Agnes Tin Mine, Toora.—Nos. 1449-1454.
Sphenopteris ampla.

Soft carbonaceous shales. Merino Creek, Merino, Western District.—Nos. 1021-1026.

Taeniopteris spatulata var. *Daintreei;* also fragments of carbonized wood.—Nos. 1021, 1023, 1025.

Taeniopteris sp.—No. 1026.

Sphenopteris sp. 1026.

Sphenopteris ampla, McCoy.—No. 1022.

Plant remains, indet.—No. 1024.

Appendix.—Notes on the Fossils.

Stenopteris sp.

The leaves in No. 662 are very slender, branching at a very acute angle, and having a well-marked central midrib like that seen in the type-form *Stenopteris elongata* Carruthers sp. On comparing the present specimen now in the National Museum collection, with the example from Jumbunna E., figured and named "Sphenopterid? sp." by Seward[1], the identity of the two seems quite convincing. Mr. Seward has already remarked on the comparison to be made with Tenison Woods' "*Trichomanites spinifolium,*" and which the former author subsequently placed under the synonymy of *Stenopteris elongata*[2].

Taeniopteris spatulata, var. *crenata,* McClelland.

T. crenata, McClelland, 1850, Rep. Geol. Surv., India, for 1848-9, pl. XVI., fig. 3.

Some very fine examples of a broad-leaved form of *Taeniopteris,* like the variety *Carruthersi,* but having lobulate edges towards the base, occur in the present series. They are closely comparable with McClelland's *T. crenata* from the Rajmahal Hills, in India, and there seems to be good reason for assigning them to this form, merely as a variety of *T. spatulata.* Zeiller figures[3] a similarly incised frond as an accidental variety of *T. Jourdyi,* Zeill., which species, by the way, agrees in many points with *T. spatulata.* var. *Carruthersi.*

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1. Rec. Geol. Surv. Vict. Vol. I., Pt. 3, 1904, p 167, pl. XIII., fig. 17.
2. Annals S. African Mus., Vol. IV., Pt I., 1903, p. 70, pl. VII., figs. 2, 3.
3. Etudes des Gites Minéraux de la France, "Flore Fossile des Gites des Charbon du Tonkin." Paris, 1903, pl. XII., fig 8.

Rhizomopteris Etheridgei, Seward.

The series of specimens from the Proprietary Mine, Coal Creek, is of the greatest interest, from the fact that it affords evidence of the actual relationship of the plant-remains hitherto referred to as *Taeniopteris* and *Rhizomopteris* respectively. Similar specimens of the latter were described by Seward, who suggested that they belonged to a fern which bore fronds possibly of the type *Cladophlebis denticulata*, var. ***australis***. Some of the present examples show the basal portion of fronds of *Taeniopteris* of the varietal form *Daintreei* in juxtaposition to the creeping stem. There can be very little doubt as to the relationship of these roots and leaves, for in an extensive series of specimens there are no other plant-remains, and these two occur in abundance. Zeiller has already referred to the probable habit of *Taeniopteris* fronds growing in tufts as in *Scolopendrium*, and figures an example which supports the statement[1].

Podozamites Kidstoni, Eth. fil.

Geol. & Pal. of Queensland, 1892, p. 317, pl., XVIII. fig. 6.

Several examples of fossil plant-remains referable to *Podozamites Kidstoni* occur in the present series, from Archie's Creek, Ruby Creek, and Binginwarri, all in South Gippsland. Its occurrence for the first time in Victoria is especially noteworthy, since it was only known previously from the Burrum Coal-fields near Maryborough, Queensland. The latter horizon is below the Ipswich Series, and may be Triassic in age.

GENERA AND SPECIES NOTED IN THE FOREGOING REPORT.

Bryophyta.

(?)*Marchantites* sp.

Equisetales.

Equisetites sp.

Filicales.

Coniopteris hymenophylloides, Brongn. sp. var. *australica*, Seward.
Cladophlebis denticulata, Brongn. sp., var. *australis*, Morris.
Sphenopteris ampla, McCoy.
Sphenopteris ampla, McCoy, var., *crassinervis*, McCoy.
Thinnfeldia odontopteroides, Morris sp.
Thinnfeldia Maccoyi, Seward.
Taeniopteris spatulata, McClelland.
Taeniopteris spatulata, var., *Carruthersi*, T. Woods.
Taeniopteris spatulata, var., *Daintreei*, McCoy.
Taeniopteris spatulata, var., *crenata*, McClelland.
Rhizomopteris Etheridgei, Seward. (Probably roots of *Taeniopteris*).

Ginkgoales.

Baiera australis, McCoy.

Gymnosperms of *uncertain affinities.*

Carpolithes sp.
Conites sp.

Coniferales.

Araucarites sp.
Araucarioxylon sp.
cf. *Albertia australis*, McCoy.
Palissya australis, McCoy.
Taxites sp.
Brachyphyllum gippslandicum, McCoy.

1. Op. supra cit., p. 69, pl. XI. fig. 4.

Podozamites Barkleyi, McCoy.
Podozamites ellipticus, McCoy.
Podozamites Kidstoni, Eth. fil.

Plants of Doubtful Position.

Stenopteris elongata, Carruthers sp.
Stenopteris sp.

Explanation of Plates.

All figures magnified about one and a half times.

Plate XIII.

Fig. 1.—*Carpolithes* sp. A bean-shaped seed. Also leaves of *Taeniopteris* sp. No. 669. Outtrim Bridge Railway Cutting.

Fig. 2.—*Sphenopteris ampla*, McCoy. Variety with dentate terminations to the pinnules. No. 1339. Binginwarri.

Fig. 3.—*Stenopteris* sp. A slender leaved species. No. 662. Jumbunna.

Fig. 4.—*Stenopteris elongata*, Carruthers sp. No. 1319. Binginwarri.

Plate XIV.

Figs. 5, 6.—*Taeniopteris spatulata*, var. *crenata*, McClelland. Nos. 1079 and 1081. Allambee.

Fig. 7.—*Rhizomopteris Etheridgei*, Seward. Siliceous cast of vascular bundle. No. 782. Coal Creek, Korumburra.

Plate XV.

Fig. 8.—Leaves of *Taeniopteris spatulata*, McClelland, and rhizomata of *Rhizomopteris Etheridgei*, Seward, associated on the same slab. No. 775. Coal Creek, Korumburra.

Plate XVI.

Fig. 9.—*Rhizomopteris Etheridgei*. An especially large rhizoma, throwing off auxiliary roots. No. 706. Coal Creek, Korumburra.

Plate XVII.

Fig. 10.—Root of (?)*Equisetites*. No. 673. Jumbunna.

Fig. 11.—*Rhizomopteris Etheridgei*. Showing part of a thick rhizome with minor pittings, and the surrounding shale covered with fine adventitious rootlets. No. 693. Korumburra.

Plate XVIII.

Fig. 12.—*Rhizomopteris Etheridgei*. Part of a thick rhizome with bases of the rootlets attached. No. 707. Korumburra.

Fig. 13.—*Conites* sp. No. 1336. Binginwarri.

Fig. 14.—*Podozamites Kidstoni*, Eth. fil. No. 1173. Archie's Creek.

Fig. 15.—*Equisetites* sp. Stem with nodal diaphragm. No. 672. Near Outtrim North.

[*Report sent in 9.9.08.*]

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PRESENTED

PLATE XIII.

FIG. 1.

FIG. 3.

FIG. 2.

FIG. 4.

F.C., photo.

TÆNIOPTERIS, SPHENOPTERIS, AND STENOPTERIS.
JURASSIC : SOUTH GIPPSLAND.

Plate XIV.

Fig. 5.

Fig. 7.

Fig. 6.

F.C., photo.

TÆNIOPTERIS AND RHIZOMOPTERIS. JURASSIC: SOUTH GIPPSLAND.

BRITISH MUSEUM
NATURAL HISTORY

Plate XV.

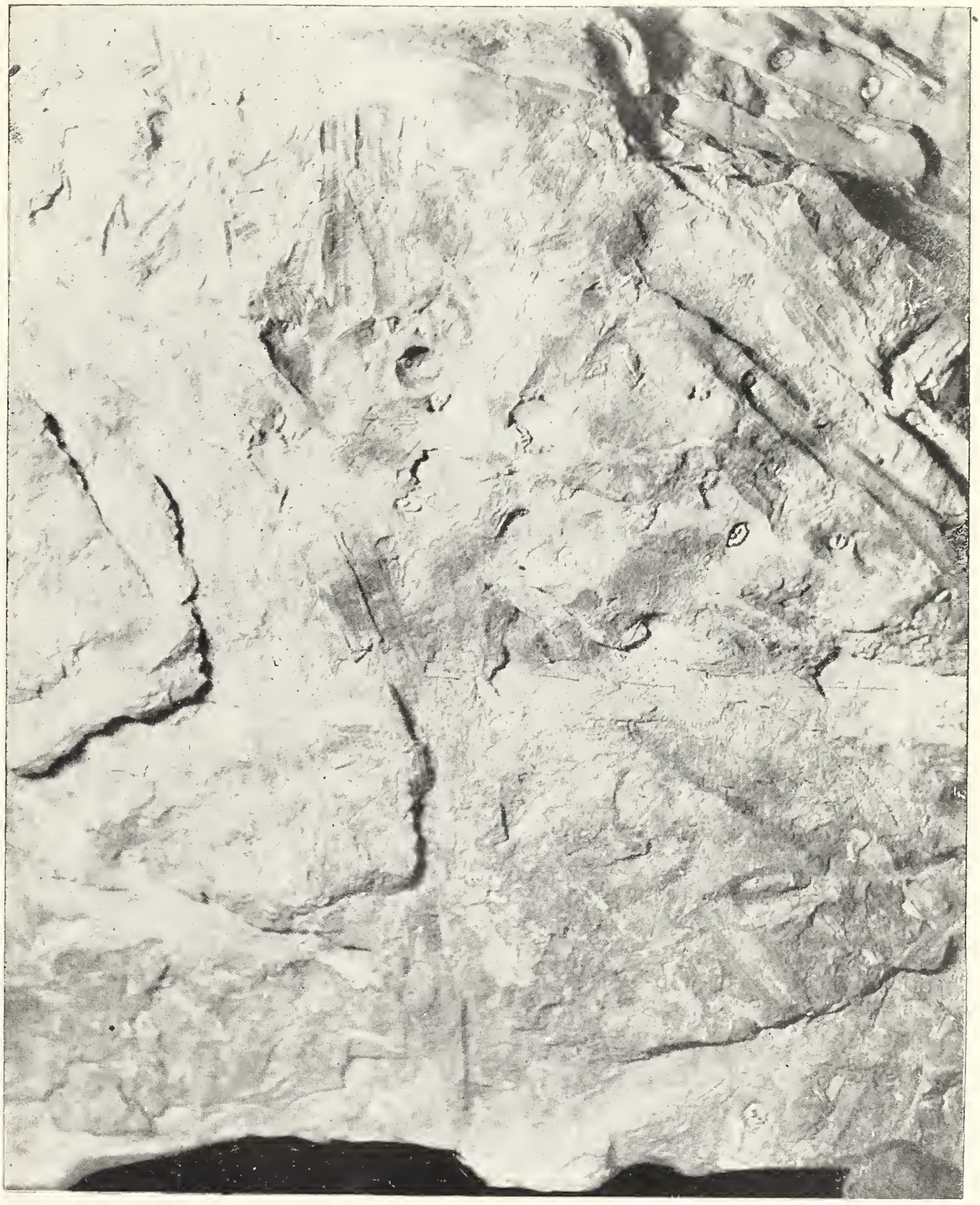

Fig. 8.

F.C., photo.

TÆNIOPTERIS AND RHIZOMOPTERIS. JURASSIC: SOUTH GIPPSLAND.

BRITISH MUSEUM
NATURAL HISTORY

Plate XVI.

Fig. 9.

F.C., photo.

RHIZOMOPTERIS ETHERIDGEI. JURASSIC: SOUTH GIPPSLAND.

BRITISH MUSEUM
NATURAL HISTORY

Plate XVII.

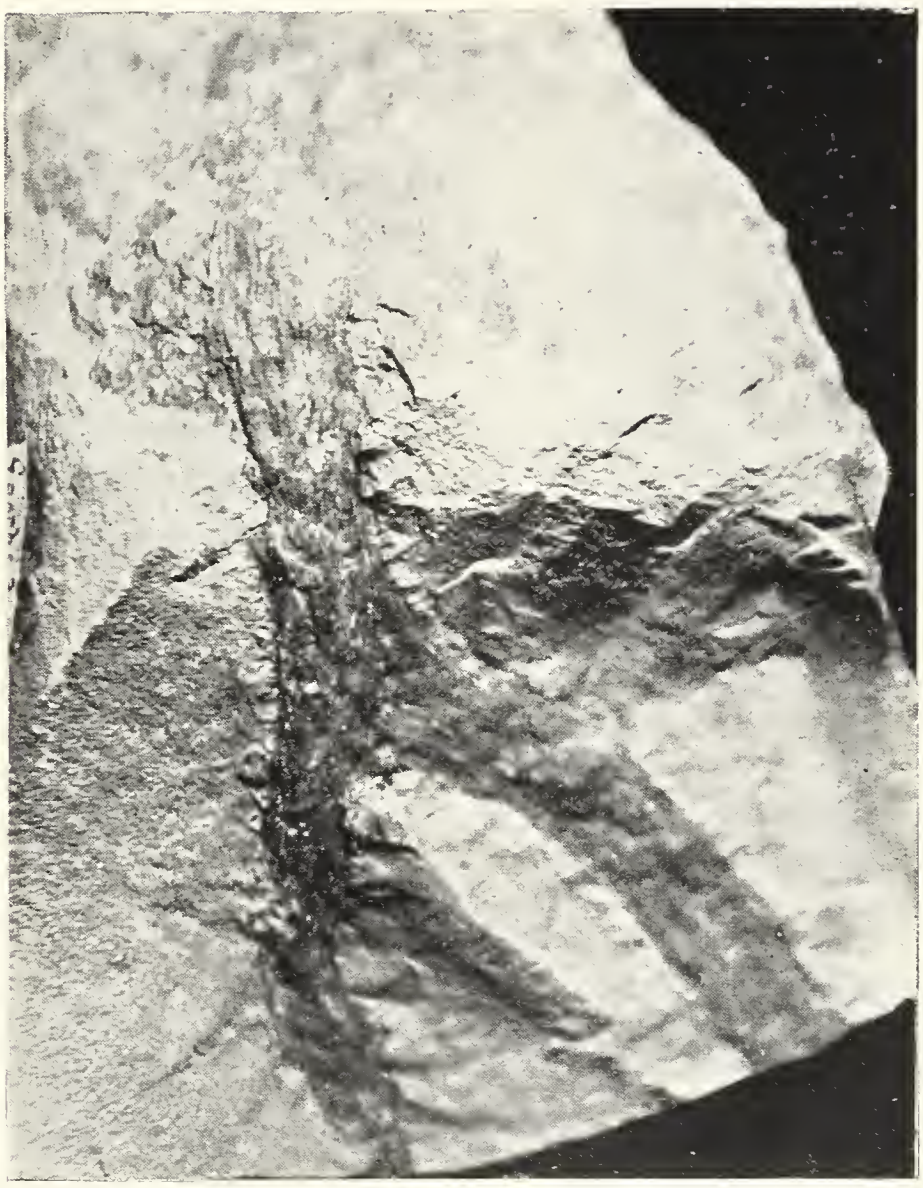

Fig. 10.

Fig. 11.

F.C., photo.

? EQUISETITES AND RHIZOMOPTERIS. JURASSIC: SOUTH GIPPSLAND.

BRITISH MUSEUM
NATURAL HISTORY

Plate XVIII.

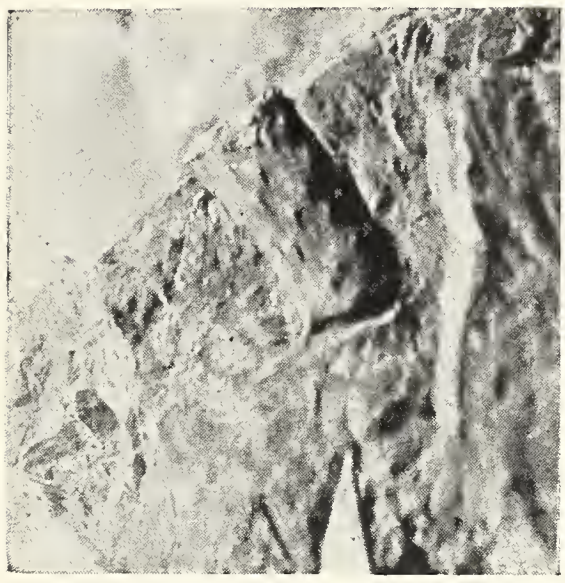

Fig. 12.

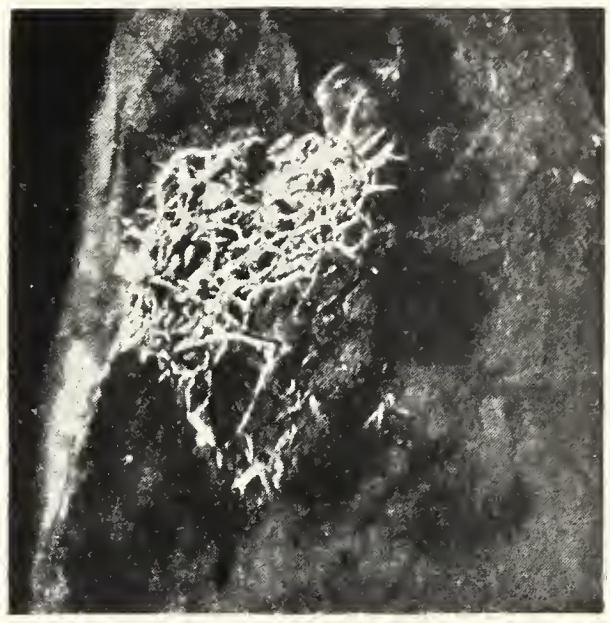

Fig. 13.

Fig. 14.

Fig. 15.

F.C., photo.

NATURAL HISTORY

VICTORIA.

LOCALITY PLAN SHOWING POSITIONS OF PLACES MENTIONED IN THIS NUMBER.

1. Moyston.
2. Stawell.
3. Piggoreet.
4. Goldsborough.
5. Dunolly.
6. Tarnagulla.
7. Ballarat.
8. Daylesford.
9. Chewton.
10. Sedgwick.
11. Redesdale.
12. Kilmore.
13. Warrandyte.
14. Jamieson.
15. Wood's Point.
16. Stockdale.
17. Chiltern.
18. Beechworth.
19. Mt. Wellington.
20. Bairnsdale.
21. Orbost.
22. Bonang.
23. Bendoc.
24. Harrietville.
25. Bright.
26. Stony Creek.
27. Bethanga.
28. Koetong.
29. Cudgewa.
30. Pine Mountain.
31. Corryong.
32. Toora.
33. Bena.
34. Jumhunna.
35. Outtrim.
36. Kornmburra.
37. San Remo.
38. Kilcunda.
39. Welshpool.
A. Wonthaggi.
B. Kongwak.
C. Koorooman.
D. Drumdlemara.
E. Allambee East.
F. Binginwarri.
G. Devon.

FOSSIL LOCALITIES +
OTHER LOCALITIES ⊙

Fossil Localities +
Other Localities ⊙

Boroughs indicated thus, -☆

Scale of Miles

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